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Mitteilungen der Botanischen Staatssammlung
und des Instituts für Systematische Botanik
der Universität München

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Band 1 München 1993

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Die Mitteilungen der Botanischen Staatssammlung München

wurden im Jahre 1950 von dem damaligen Leiter Prof. Dr. Karl SUESSENGUTH begründet. Es bot sich ihm hiermit die Möglichkeit, bei den zu der damaligen Zeit stark eingeschränkten Publikationskapazitäten eigene Arbeiten und die seiner Schüler rasch und problemlos zu veröffentlichen. So erschienen denn die einzelnen Hefte, die erst später zu Bänden zusammengefaßt wurden, bei Bedarf in unregelmäßigen Abständen. Schon bald erwarb sich die neue Zeitschrift internationale Anerkennung. Allmählich konnte so ein intensiver Schriftentausch aufgebaut werden. Mit der Gründung des Instituts für Systematische Botanik an der Universität München im Jahre 1958 und der damit verbundenen Personalunion des Direktors im Bereich von Staatssammlung und Institut stieg das Angebot an wissenschaftlichen Arbeiten und damit der Umfang der Mitteilungen stark an. Seit 1977 konnte in jedem Jahr mindestens 1 Band publiziert werden. Somit wurden die "Mitteilungen" in bedeutendem Umfang auch das Publikationsorgan des Instituts für Systematische Botanik, dies umsomehr als auch die Redaktion seit 1980 in den Händen des Institutes lag.

Auf Grund der somit stark veränderten Grundvoraussetzungen war der Entschluß fast zwangsläufig, mit dem Band 30 die **Mitteilungen der Botanischen Staatssammlung** abzuschließen und unter einem neuen Namen und mit einem neuen Gesicht weiterzuführen.
Die neue Serie wird unter dem Namen

Sendtnera

(Mitteilungen der Botanischen Staatssammlung und des Instituts für Systematische Botanik der Universität München)

erscheinen. Ein Registerband für die Bände 1-30 der alten Serie ist geplant.

Otto SENDTNER (1813-1859) war von 1843 an als persönlicher Mitarbeiter von MARTIUS für die Flora Brasiliensis tätig, wurde dann 1848 Adjunkt des Herbars und 1857 sowohl 1. Konservator des Herbars als auch Professor für Botanik der Universität München.

Seine wichtigsten wissenschaftlichen Leistungen waren die botanische Erforschung des damals noch weitgehend unzugänglichen Bosniens und vor allem von Bayern. Mit seinen Werken "Die Vegetations-Verhältnisse Südbayerns nach den Grundsätzen der Pflanzengeographie" (1854) und "Die Vegetations-Verhältnisse des Bayerischen Waldes nach den Grundsätzen der Pflanzengeographie" (1860) gilt SENDTNER als der Begründer der Vegetationskunde als eigene, moderne Teildisziplin der Botanik. Auch als Kenner und Erforscher der alpinen Moosflora ist SENDTNER international bekannt geworden.

Mit dem Namen **Sendtnera** ehren wir einen Forscher, der sich im Bereich von Sammlung und Universität um die Botanik verdient gemacht hat.

Die Herausgeber

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Neurada - eine Gattung der Malvales

von

H. HUBER

Abstract:
HUBER, H.: Neurada - eine Gattung der Malvales. - Sendtnera 1: 7-10. 1993. ISSN 0944 - 0178.

The systematic position of *Neurada* (formerly *Neuradaceae*) is discussed. Its position as an aberrant genus within the *Tiliaceae* is proposed.

Konvergenzen sind bekanntlich die große Herausforderung für die systematische Biologie, lassen sie doch Unverwandtes ähnlich und Zusammengehöriges fremdartig erscheinen. Der Konsens darüber ist allgemein, aber er macht vergessen, daß es jenseits der strukturellen Konvergenzen noch andere gibt, aus der Diskussion verdrängt und gerade deshalb folgenschwer, nämlich die der Lehrmeinungen, diktiert weniger von Vertrautheit mit den Objekten als vielmehr dem Unbehagen an einer noch immer nicht abgeschlossenen, immer Neues, aber nicht immer Willkommenes gebärenden Wissenschaft, dem allem und allen Etablierten immanenten Verlangen nach Dauer mit seinem Gebot einer "harmonization of concepts" - oder soll ich sagen "pax americana"? - hineingetragen aus unschwer durchschaubaren "Sachzwängen" in eine relikthaft noch immer dem siècle des lumières verpflichtete Systemlehre.

Ein schönes Beispiel für dieses Doppelspiel der Konvergenzen liefert die Gattung *Neurada*, deren Zugehörigkeit zu oder nahe Verwandtschaft mit den Rosaceen von einer wenig beachteten Ausnahme abgesehen die letzten hundert Jahre unangefochten blieb, obwohl MURBECK (1916) die Samenschale so ausführlich beschrieb, daß eine auch nur entfernte Beziehung zu dieser Familie ausgeschlossen war. Seither ist nur eine einzige, durch Argumente gestützte Abweichung von der überkommenen Zuordnung aufgetaucht, nämlich bei AIRY SHAW (1973), der feststellt:

> "Perh. nearest to Malvaceae: cf. leaf-cutting, vertic. carpels, ect. The yellow Corolla of *Grielum* and *Neuradopsis* changes colour in drying to bluish-black, as in e.g. *Althaea ficifolia* Cav."

Unerwähnt bleiben die lysigenen Schleimkanäle im Mark von *Neurada*, die SOLEREDER (1899) beschrieb und die es bei den Rosales nicht gibt. AIRY SHAW's Ansicht schlug sich in der Literatur allein bei DAHLGREN (1975) nieder, aber schon fünf Jahre später schloß sich der des Konformismus sonst unverdächtige Autor der herkömmlichen Meinung an und reihte die Neuradaceen umittelbar den Rosaceen an wie früher TAKHTAJAN (1959), SCHULZE-MENZ (1964) und CRONQUIST (1968). Abgesehen von AIRY SHAW scheint keiner der Autoren ein rechtes Bild von der Pflanze gehabt zu haben und nur CRONQUIST (1981) macht sich die Mühe, sein Urteil zu begründen:

> "All of the features in which the Neuradaceae differ from typical Rosaceae represent phyletic advances".

Abgesehen davon, daß hier Plesiomorphien zu Zeugen einer Verwandtschaft berufen werden, bedarf der Satz einer Korrektur, denn wenigstens in einem Merkmal sind die Rosaceen wie die

ganzen Rosales weiter abgeleitet als *Neurada*, nämlich im Bau der Samenschale. Diese geht bei den Rosales entweder aus beiden Integumenten hervor oder nur aus einem, sei es, daß die beiden verwachsen oder daß das innere schwindet. Sofern die Samenschale ein Festigungsgewebe führt, beteiligt sich allein das äußere Integument daran, oft nur die äußere Epidermis (Exotesta-Samen) oder die äußere Epidermis zusammen mit Zwischenschichten (Exomesotesta-Samen), selten nur die Zwischenschichten (Mesotesta-Samen). Die Innenepidermis des äußeren Integuments nimmt daran keinen Anteil. Die steinfrucht- oder nußartigen Fruchtbildungen vieler Gattungen führen oftmals zum Verlust eines jeglichen Festigungsgewebes in der Samenschale. Dem inneren Integument (Tegmen) gehen verdickte Zellwände stets ab; deshalb ist es im reifen Samen meist zerdrückt, nur die Innenepidermis - nicht selten mit braunen Wandbelägen - behält häufig ihre Zellgliederung bei.

Ganz anders *Neurada*. Ihre Integumente sind noch im reifen Samen gut unterscheidbar: das äußere, farb- und fast strukturlos, kollabiert; zum mechanischen Gewebe trägt allein das innere bei und auch das nur mit seiner Außenepidermis (Exotegmen), also gerade der Schicht, die bei den Rosales nirgends hervortritt. Die Wände der nächst inneren Zellage sind zwar noch getüpfelt wie das Exotegmen, aber dünn, und das Lumen ist von braunvioletten Massen ausgefüllt. Nach innen schließen sich zwei ähnlich dünnwandige Zellschichten an, ohne erkennbare Tüpfel, farblos und scheinbar leer. Die übrigen Schichten des inneren Integuments sind bis auf die innerste farblos; diese wird von Gerbstoffen rauchbraun gefärbt. Charakterschicht der Samenschale ist das Exotegmen. Nur in ihm kommt es zu einer Streckung der Zellen und das sowohl längs als auch - weniger stark - radial; die Zellen erscheinen deshalb auf dem Querschnitt als Palisaden und auf dem Längsschnitt als liegende Rechtecke; am besten beschreibt man sie als verkürzte Lamellen, die auf der Längskante stehen. Im Lumen gibt es Oxalatkristalle, aber sie sind nicht auffällig. Sonderbar ist die Differenzierung dieser Zellen in einen distalen und einen proximalen Teil, von denen der erste ungefähr ein Drittel, der andere zwei Drittel der Zellhöhe einnimmt. Die zwei Zonen sind ziemlich scharf voneinander abgesetzt und unterscheiden sich farblich (der distale ist dunkler gelb als der proximale) und in ihrer Tüpfelung (die Tüpfelkanäle des proximalen Teils sind breiter als die des distalen).

Samen mit einem Exotegmen aus längs gestreckten, in der Regel faserförmigen Zellen sind bei den Angiospermen verbreitet, häufig im Verein mit einer kristallführenden Endotesta (Innenepidermis des äußeren Integuments). Beispiele dafür gibt es in beiden Hauptgruppen. Mit höherem Ableitungsgrad verliert sich die Kristallschicht und im Exotegmen macht sich eine Neigung breit, die Zellen radial zu strecken, sei es, wie bei *Neurada* und *Tilia*, daß sie an der Längsstreckung festhalten oder, wie bei den Malvaceen, zu Palisaden werden und im periklinen Schnitt isodiametrisch erscheinen. Weitere Abweichungen vom Ausgangsmodell, die aber *Neurada* nicht betreffen, sind das mehrschichtige Exotegmen (*Capparis*, Flacourtiaceen z.T.) und ein solches mit wellig verzahnten Antiklinwänden, wie bei den Geraniaceen und Guttiferen. In diesem Zusammenhang ist bemerkenswert, daß A.P. DE CANDOLLE 1825, sich der Zugehörigkeit von *Neurada* zu den Rosaceen weniger gewiß als die meisten seiner Nachfolger war, die Möglichkeit einer Verwandtschaft mit *Biebersteinia* erwog ('an *Biebersteinia* huc forsan revocanda ?). Das wäre, verglichen mit dem Einschluß in die Rosaceen, die richtigere Entscheidung gewesen, aber nicht die richtige, wie die apotropen Samenanlagen von *Neurada* (die der Geraniaceen sind epitrop), das Exotegmen (jenes von *Biebersteinia* nähert sich dem von *Geranium* und *Hypericum*) und die Samen-, besser Embryoöle belegen. Sowohl in einem palisadenzelligen Exotegmen wie in einem mit verzahnten Antiklinwänden kann eine 'linea lucida' vorkommen, die es bei *Neurada* nicht gibt, aber die zonierte Zellwand deutet eine solche an.

Zumindest die markständigen Schleimkanäle und die Samenschale legen es nahe, den Anschluß von *Neurada* statt bei den *Rosales* bei den *Malvales* zu suchen, deren abgeleitete Familien häufig wie *Neurada* einen Außenkelch führen und - hierin den *Rosales* unähnlich - in der Knospe klappige Sepalen und gedrehte Petalen; auch gekrümmte Embryonen kommen vor. Die Übereinstimmung ist nicht vollkommen, dafür stehen die Epigynie von *Neurada*, ihr

dreikerniger und auch sonst eigentümlicher Pollen (ERDTMAN 1952), die dreien Styluli und die tafelförmigen Zellen des Exotegmens, aber epigyne Blüten werden auch für eine Gattung der Tiliaceen angegeben, freie Styluli für mehrere Sterculiaceen *(Cola, Heritiera)* und das Exotegmen von *Tilia* und *Triumfetta* (CORNER 1976), kommt, was die Zellform angeht, dem von *Neurada* ganz nahe.

Das alles spricht für die Zugehörigkeit von *Neurada* zu den *Malvales*, aber ein letztes mögliches Beweisstück steht noch aus: eine Besonderheit der "höheren" *Malvales* sind die Cyclopropensäuren (Stercul- und Malvalsäure) im Embryo und wenn auch angesichts einiger für die Ordnung untypischer Merkmale ihr Vorkommen bei *Neurada* nicht allzu wahrscheinlich war, bat ich Herrn Kollegen FOCK und Herrn KLUG, die für den Nachweis dieser Fettsäuren geeignete Halphenprobe (SHENSTONE u.a. 1965) durchzuführen. Die Voraussetzung dazu verdanke ich Herrn FÖRTHER mit einer reichlichen und frischen Aufsammlung von *Neurada procumbens*. Den drei Herren bin ich für ihre Mühe sehr verbunden, aber zum Dank kommt die, ich muß wohl sagen, freudige Überraschung, fiel doch die Reaktion nicht nur positiv aus, sondern ungleich stärker als bei den zum Vergleich benützten Baumwollsamen.

Damit ist der letzte Zweifel an der Stellung von *Neurada* im System der Angiospermen ausgeräumt. Was bleibt ist die eher banale Frage nach der Familienzugehörigkeit. Der klappige Kelch, die freien Filamente, dithezischen Antheren und unbedornten Pollenkörner lassen allein den Vergleich mit den Tiliaceen zu, den auch das Exotegmen nahelegt.

Unter den Tiliaceen steht *Neurada* isoliert. Zwar kommen die meisten, wenn nicht alle Neuerungen der Gattung vor, wie Einzelblüten, ein Außenkelch, Epigynie, Verdopplung der Karpelle und solche mit jeweils nur einer Samenanlage, auch endospermlose Samen, aber verstreut über mehre Unterfamilien. *Neurada*, als Tiliacee betrachtet, verkörpert eine eigene, die am weitesten abgeleitete. Das hat immerhin den Vorzug, daß die Tiliaceen durch *Neurada* nicht zu einer "paraphyletischen" Gruppe gemacht werden, eine Rücksichtnahme, die kaum lohnt, denn im Hinblick auf die Sterculiaceen sind sie es doch. Mehr Beifall verspreche ich mir vom Vorschlag, die schon 1858 von AGARDH als eigene Familie anerkannten Neuradaceen den Tiliaceen anzureihen; unterstützt wird das von dem abgeleiteten (ERDTMAN 1952) und dreikernigen Pollen, den freien Styluli und dem gekrümmten Embryo. Es bietet sich an, hier CRONQUISTS Urteil über die Neuradaceen leicht abgewandelt zu wiederholen:

> "All of the features in which the Neuradaceae differ from the Tiliaceae represent phyletic advances".

Gilt das auch für die Styluli? Natürlich sind freie Organe den verwachsenen vorausgegangen; aber Choristylie als Entwicklungshemmung - gerade bei den *Malvales*, wo sie ganz auf die abgeleiteten Familien beschränkt ist und den konservativen fehlt, muß man damit rechnen. Deshalb sehe ich in *Neurada* nicht den Vertreter einer eigenen Familie, sondern ein abgeleitetes Mitglied der Tiliaceen.

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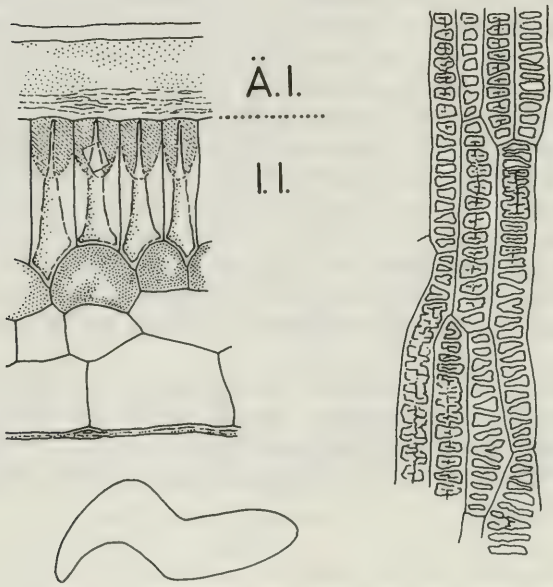

Neurada procumbens. Links oben: Querschnitt durch die Samenschale. Rechts: perikliner Schnitt durch das Exotegmen. Links unten: Embryo; die Radicula (links) ist gegen die Fruchtmitte gerichtet, die Keimblätter (rechts) nach außen. Ä.I. äußeres, I.I. inneres Integument.

Piceirhiza oleiferans, eine neue Ektomykorrhizen-Art an Picea abies *)

von

WALLER, K., AGERER, R., BRAND, F., TAYLOR, A.F.S. & WANNER, G.

Abstract:
WALLER, K., AGERER, R., BRAND, F., TAYLOR, A.F.S. & WANNER, G.: Piceirhiza oleiferans, a new species of ectomycorrhizae on Picea abies. - Sendtnera 1: 11 - 22. 1993. ISSN 0944-0178.

Piceirhiza oleiferans is comprehensively characterized and compared with other *Piceirhiza*- and *Fagirhiza*-species. Important features are a smooth , whitish habit, hyphae densely filled with oily droplets, a plectenchymatous mantle with isles of short cells and with long hyphal bundles in between. The ectomycorrhiza forming fungus belongs to the Basidiomycetes; dolipores could be proven ultrastructurally.

Einleitung

Ektomykorrhizen als symbiontische Organe zwischen Pilzen und Wurzeln besitzen eine Vielzahl von Merkmalen, die zu ihrer Charakterisierung und auch zum Erkennen von Pilzverwandtschaften herangezogen werden können (AGERER 1987-1992, 1991 a, 1993). Viele der im Boden zu findenden Ektomykorrhizen können derzeit nicht identifiziert, d.h. keinen bekannten Pilzarten zugeordnet werden. Ausführlich beschriebene, nichtidentifizierte Ektomykorrhizen erhalten eine eigene binomiale Bezeichnung (GRONBACH & AGERER 1986, WEISS & AGERER 1988, AGERER 1991 a) und werden in offiziellen Herbarien hinterlegt.

An *Picea abies* sind bisher 33 nichtidentifizierte Ektomykorrhizen-Arten beschrieben worden (zusammengestellt in AGERER 1991 b; HAUG et al. 1992); eine Art davon konnte mittlerweile identifiziert werden.

Material und Methoden

Die Methoden zur Isolierung von Ektomykorrhizen aus dem Boden, die Vorgehensweise bei

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*) Gilt als Studien an Ektomykorrhizen XLVII. - Studien an Ektomykorrhizen XLVI: Waller et al. (1993).

der Analyse und mögliche Merkmalsausprägungen wurden an anderer Stelle bereits ausführlich zusammengestellt (AGERER 1991a). Ein Glossar für die benutzten Termini ist veröffentlicht (AGERER 1987-1992). Für die Herstellung von Schnitten wurde in Historesin eingebettetes Material verwendet (AGERER 1991 a).

Die ultrastrukturellen Untersuchungen wurden nach GALLI et al. (1989) durchgeführt.

Zur Isolierung des Ektomykorrhiza-Pilzes wurden 100 Ektomykorrhizen abgenommen, auf ein mit sterilem, deionisiertem Wasser angefeuchtetem Filterpapier im Trichter (98 mm im Durchmesser) einer Saugflasche gelegt. Sterilisiert wurde mit 0,3 l 30%igem H_2O_2, das nach unterschiedlicher Einwirkzeit (1, 2, 4 min) abgepumpt wurde. Mit sterilem Wasser wurde mehrmals nachgespült. Zu jeweils Zehn wurden die Ektomykorrhizen auf Agarplatten mit unterschiedlichen Nährböden (MMN, 1/2 MMN, 1/2 MMN + 5 mg/l Benomyl; MARX 1969, TAYLOR & ALEXANDER 1989) gelegt. Ektomykorrhizen mit bereits nach zwei Tagen auswachsendem Mycel wurden entfernt, da hierbei vom Auswachsen von Fremdinfektionen ausgegangen werden mußte.

Piceirhiza oleiferans* an **Picea abies** (L.) Karst.

Referenzbeleg: Deutschland, Bayern, Landkreis Aichach, Staatsforst Höglwald, Versuchsfläche C2, vor allem im Humus, aber auch im Mineralboden, 11.12.1991, leg. F. *Brand & A.F.S. Taylor*; Ektomykorrhiza WA1 in Herb. K. WALLER (M); submontanes, oberbayerisches Tertiärhügelland, Feinsedimente des Obermiozäns als Ausgangsmaterial, im Oberboden deutliche Lößlehmkomponente, Fichtenreinbestand auf gekalkter, regenkonditioniert beregneter (KREUTZER et al. 1991), ursprünglich saurer Parabraunerde, im Unterboden mit schwacher Tendenz zur Pseudovergleyung.

HABITUS (Abb. 1 a-c)

Irregulär monopodial-pyramidal, mit vereinzelt knopfförmigen Seitenästen 2. Ordnung; Achse gerade bis leicht gebogen, Seitenäste gerade. Mykorrhizensystem bis 11 mm lang, Achse 0,5-0,9 mm im Durchmesser; Seitenäste bis 4 mm lang und 0,25-0,5 mm im Durchmesser. Mantel farblos, Wurzel durchschimmernd und dadurch Ektomykorrhiza bräunlich-rosa erscheinend, Mykorrhizaspitze weiß; Oberfläche glatt. Abziehende Hyphen nur an wenigen Stellen gut erkennbar. Rhizomorphen der Basis der Ektomykorrhiza entspringend, glatt, farblos, selten.

ANATOMIE (FLÄCHENANSICHT)

M a n t e l (Abb. 2b, Tafel 1b) in Aufsicht plectenchymatisch, aus einem dichten Netz farbloser, öltröpfchenhaltiger Hyphen; Manteltyp A/B (nach AGERER 1991 a); Hyphenzellen 40-60 µm lang, 3-5 µm im Durchmesser, Zellwand dünn. Fließender Übergang zu einer stellenweise pseudoparenchymatischen (Abb. 2c, Tafel 1 c-d) Schicht aus ovalen und vereinzelt langgestreckten Zellen, von langen Hyphen durchzogen; Zellen farblos, mit Öltröpfchen, 6-20 µm lang und 5-14 µm im Durchmesser, Zellwand 0,4-0,8 µm dick, Zahl der Zellen in 20 x 20 µm: 4-5. Fließender Übergang zur innersten, plectenchymatischen Schicht (Abb. 3 a-b, Tafel 2 a) aus langgestreckten Hyphen, mit Inseln aus rundlichen und

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*) Etymologie: *Piceirhiza*: Ektomykorrhiza an *Picea; oleiferans*: bezieht sich auf die vielen Öltröpfchen in den Hyphen.

vereinzelten, daraus langgestreckt hervorwachsenden Zellen, somit pseudoparenchymatische Inseln in plectenchymatischem Hypengeflecht darstellend; Hyphen farblos, mit Öltröpfchen, Hyphenzellen 15-60 µm lang, 3-4 µm im Durchmesser, Zellwand 0,3-0,5 µm. Mantel der Mykorrhizaspitze mit gleichem Aufbau.

Abziehende Hyphen (Abb. 2a) farblos, 2,5-5 µm im Durchmesser, zum großen Teil kurz, 20-30 µm lang und aus einer Zelle bestehend oder 60-120 µm lang mit Septenabständen bis 40 µm, mit Öltröpfchen und vereinzelt mit Schnallen, Zellwand 0,3 µm, selten 0,6 µm; Anastomosen vereinzelt, ohne Septum.

Rhizomorphen (Abb. 3c) selten, 20-30 µm im Durchmesser, Rand glatt (nur an W2 gefunden); Aufbau einfach, d.h. alle Hyphen gleich gestaltet; Rhizomorphentyp B (nach AGERER 1991 a); Hyphen farblos, öltröpfchenhaltig, Septenabstand 15-130 µm, Zellen 2,5-3,5 µm im Durchmesser, Zellwand 0,6-07 µm, abziehende Hyphen selten, mit gleichen Abmessungen.

ANATOMIE (QUERSCHNITT)

Mantel (Tafel 2a) 50-60 µm dick, aus drei, voneinander abgrenzbaren Schichten bestehend; Hyphen sehr kompakt beisammenliegend, an der Innen- und Außenseite des Mantels mit kleinem, in der Mitte mit bis zu 4fach vergrößertem Zellumen; abziehende Hyphen selten. Außenseite des Mantels aus einer 2-4 Zellschichten breiten, 10 µm dicken Lage aus tangential verlaufenden Hyphen; Hyphen 3-4 µm im Durchmesser, Zellwand dünn, Schicht sehr zart, häufig abgerissen. Mittelschicht 20-25 µm dick, aus ovalen bis länglichen Zellen, Längsachse stets tangential zur Wurzel; Zellen 3-12 µm lang, 3-12 µm im Durchmesser, Zellwand (0,5) 0,8 (1) µm dick, verschleimt. Innenseite aus 10-15 µm dicker Schicht, Zellen meist tangential, selten quer angeschnitten, meist kollabiert; Zellen sehr schmallumig, 3 µm im Durchmesser, Zellwand 0,3-0,5 µm, verschleimt.

Tanninzellen (Tafel 2f): unregelmäßig tangential-oval, 1-2(3) Zellschichten umfassend, tangential (15)20-55(60) µm, radial 4-14 µm, durchschnittliche tangentiale Länge (TCt) = 34,2 µm, durchschnittlicher Quotient tangential : radial (TCq) = 4,2; Hyphen des Hartigschen Netzes einschichtig, in älteren Mykorrhizen auch bis 2(3)schichtig und dann Rindenrestzellwände verdickt, 2,5-4 µm dick (bis 5 µm wenn mehrreihig), annähernd rund, in älteren Mykorrhizen radial-oval.

Rindenzellen (Tafel 2f): Hartigsches Netz bis zur Endodermis vordringend, z.T. auch noch in äußeren Zellwänden der Endodermis, Rindenzellen tangential-oval bis radial-oval, tangential (11) 18-32 µm, radial (10)14-20(25) µm, durchschnittliche tangentiale Länge (CCt) = 21,9 µm, durchschnittlicher Quotient tangential : radial (CCq) = 1,4; Hyphen des Hartigschen Netzes einschichtig (in älteren Mykorrhizen auch bis zweischichtig), zylindrisch (in älteren Mykorrhizen rundlich bis radial-oval), 2-3(4) µm dick (in älteren Mykorrhizen bis zu 5 µm).

ANATOMIE (LÄNGSSCHNITT)

Mantel (Tafel 2b-c) dem Querschnitt entsprechend. Mantel der Mykorrhizaspitze 40-50 µm dick, fast ausschließlich aus runden Zellen, 2-3 µm im Durchmesser an der Mantelinnenseite, 4-5 µm im Durchmesser in der Mantelmittelschicht, Mantelaußenseite aus 2-

3 Zellschichten dicker Lage tangential verlaufender Hyphen, Hyphen 4-5 µm im Durchmesser, Zellwände 0,5 µm dick.

T a n n i n z e l l e n (Tafel 3d): asymmetrisch-elliptisch bis unregelmäßig zylindrisch, parallel zur Wurzeloberfläche liegend, tangential (30)50-130(150) µm, radial 7-17 µm, durchschnittliche tangentiale Länge (TCt) = 83 µm, durchschnittlicher Quotient tangential: radial (TCq) = 7,3.

R i n d e n z e l l e n (Tafel 2d): unregelmäßig elliptisch, parallel bis leicht schräg zur Wurzeloberfläche liegend, tangential (32)45-100 µm, radial 12-25(33) µm, durchschnittliche tangentiale Länge (CCt) = 79,8 µm, durchschnittlicher Quotient tangential : radial (CCq) = 4,6.

H a r t i g s c h e s N e t z i n F l ä c h e n a n s i c h t (Tafel 2g): schwach bis typisch palmetti-artig verzweigt, Loben 2-4 µm breit.

FARBREAKTIONEN DES MANTELS MIT VERSCHIEDENEN CHEMISCHEN REAGENZIEN

Säurefuchsin: keine Reaktion (= kR); Anilin: kR; Brillantkresylblau: kR; Milchsäure- Baumwollblau: kR; Ethanol 70%: kR; Eisensulfat: kR; Formol 40%: kR; Guaiak: kR; Kalilauge: kR; Milchsäure: kR; Phenol: kR; Phenol-Anilin: kR; Rutheniumrot: kR; Sulfovanillin: kR; Sudan IV: Öltröpfchen rot.

AUTOFLUORESZENZ

Ganze Ektomykorrhiza unter der UV-Handlampe: 254 nm: keine; 366 nm: keine. Längs- und Querschnitte im Fluoreszenz-Mikroskop: UV-Filter (340-380 nm): äußere Mantelschicht crème, mittlere und innere fahlbläulich; Blau-Filter (450-490nm): äußere Mantelschicht orange-gelb; Grün-Filter (530-560 nm): rot.

KERNFÄRBUNG (mit Karminessigsäure)

2 Kerne pro Zelle, 1,5-4 µm im Durchmesser oder leicht oval, meist dicht zusammenliegend, häufig an den Septen.

STERILKULTUR

Sterilkultur besonders erfolgreich bei 2minütiger Behandlung der Mykorrhizen mit 30% H_2O_2 und Aufbringen auf 1/2 MMN.

Kolonie im Jugendstadium, nach ca. 10 Wochen 2 cm im Durchmesser, aus weißem Mycel bestehend, mit leicht ausgefranstem Rand, ab 2 cm Durchmesser Mycel stärker aushyphend und farblosen, ausgefransteren Hof bildend; Hyphen ausschließlich im Substrat wachsend, mit vielen Öltröpfchen, ohne Schnallen; Hyphen 3-4 µm im Durchmesser, zum Teil blasig angeschwollen, Zellwand dünn; Hyphen verzweigt; Anastomosen selten, mit Kontaktsepten.

Ergebnisse: Anzahl gewachsener Kolonien/Anzahl auf Medium ausgelegter Mykorrhizen.

Agarmedium	ohne Behandlung ohne H_2O_2	1 Minute H_2O_2	2 Minuten H_2O_2	4 Minuten H_2O_2
1/2 MMN	0/10	1/20	9/20	1/20
1 MMN			2/10	
1/2 MMN + 5 mg/l Benomyl			4/20	

ULTRASTRUKTUR

Zellwand lamelliert, Öltröpfchen in den Hyphenzellen schwarz, Zellkerne sehr nahe zusammenliegend und nahe den Septen, Septen mit Doliporus.

UNTERSUCHTES MATERIAL

Referenzbeleg. - Weiteres Material: Deutschland, Bayern, Landkreis Aichach, Staatsforst Höglwald, Versuchsfläche C2, in Mineralboden, 06.03.1992, leg. *F. Brand, A.F.S. Taylor & K. Waller*, Ektomykorrhiza WA2 in Herb. K. WALLER (M).

Diskussion

Durch die glatte, weiße Oberfläche und zusammen mit den vielen Öltröpfchen in den Hyphenzellen, dem nicht gelatinösen Aufbau und durch lediglich spärlich auftretende Schnallen ist diese Art eindeutig charakterisiert.

Eine ähnliche Ektomykorrhiza ist allerdings an *Fagus* bekannt. *Fagirhiza oleifera* (BRAND 1991) besitzt ebenfalls viele Öltröpfchen in den Hyphenzellen, der Aufbau des Mantels unterscheidet sich jedoch von jenem von *Piceirhiza oleiferans*. Die Manteloberfläche von *Fagirhiza oleifera* besteht aus einem Plectenchym aus netzig, zum Teil sternförmig verzweigten, kurzzelligen Hyphen, während jener von *Piceirhiza oleiferans* aus einem dichten Plectenchym mit Inseln aus kurzen Zellen mit zwischenliegenden Hyphenbündeln aufgebaut ist. Die Mantelinnenfläche ist in beiden Arten plectenchymatisch, doch zeigen sich bei *Piceirhiza oleiferans* auch in dieser Schicht deutliche Inselbildungen. Da solche Unterschiede in der Mantelstruktur nach den bisherigen Erkenntnissen (AGERER 1987-1992, PILLUKAT 1991, PILLUKAT & AGERER 1992, TREU 1990) auf von verschiedenen Pilzarten gebildete Merkmale schließen lassen, kann davon ausgegangen werden, daß *Piceirhiza oleiferans* und *Fagirhiza oleifera* von unterschiedlichen Pilzarten gebildet werden. Eine weitere, Öltröpfchen führende Ektomykorrhizen-Art an Buche, *Fagirhiza globulifera* (BRAND 1991), besitzt kopfige

Cystiden auf der Manteloberfläche und ist somit ebenfalls gut von *Piceirhiza oleiferans* abgrenzbar.

Der an der Bildung von *Piceirhiza oleiferans* beteiligte Pilz gehört aus mehreren Gründen zu den Basidiomycetes. Er bildet gelegentlich Schnallen, besitzt Kernpaare, weist eine im Elektronenmikroskop erkennbare, lamellierte Zellwand auf und bildet Doliporen. Außerdem ist das Wachstum auf mit Benomyl versetztem Nährmedium ein Hinweis auf einen Basidiomyceten; Ascomyceten werden meist durch diesen Zusatz am Wachstum gehindert (SUMMERBELL 1987). Da die gewonnene Kultur weder vereinzelte Schnallen besitzt, noch eine erfolgreiche Synthese von Ektomykorrhizen an Fichten-Sämlingen gelang, jedoch septierte Anastomosen bildete (nicht an der Ektomykorrhiza aufzufinden), ist unsicher, ob der richtige Pilz aus der Ektomykorrhiza isoliert wurde. Allerdings spricht die oftmalige Isolierung aus den Ektomykorrhizen und langsames Wachstum für die Inkulturnahme des symbiontischen Pilzes. Die in den Kulturhyphen auftretenden Öltröpfchen kommen in Kulturen vieler Pilze vor.

Danksagung

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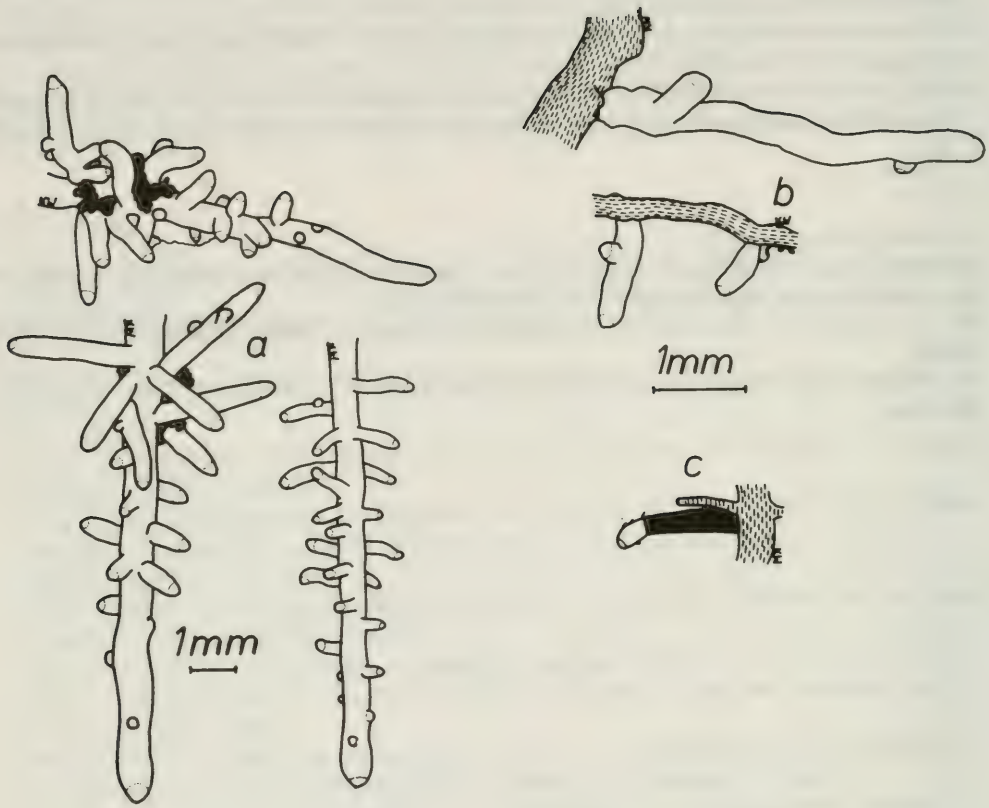


Abb. 1 - *Piceirhiza oleiferans*. - a. Habitus, monopodial-pyramidal verzweigtes Mykorrhizensystem. - b. Habitus, junge Mykorrhizen. - c. Habitus, Mykorrhiza von *Piceirhiza oleiferans* an der Spitze von *Piceirhiza nigra* wachsend. (Abb. a von WA2; Abb. b-c von WA1).

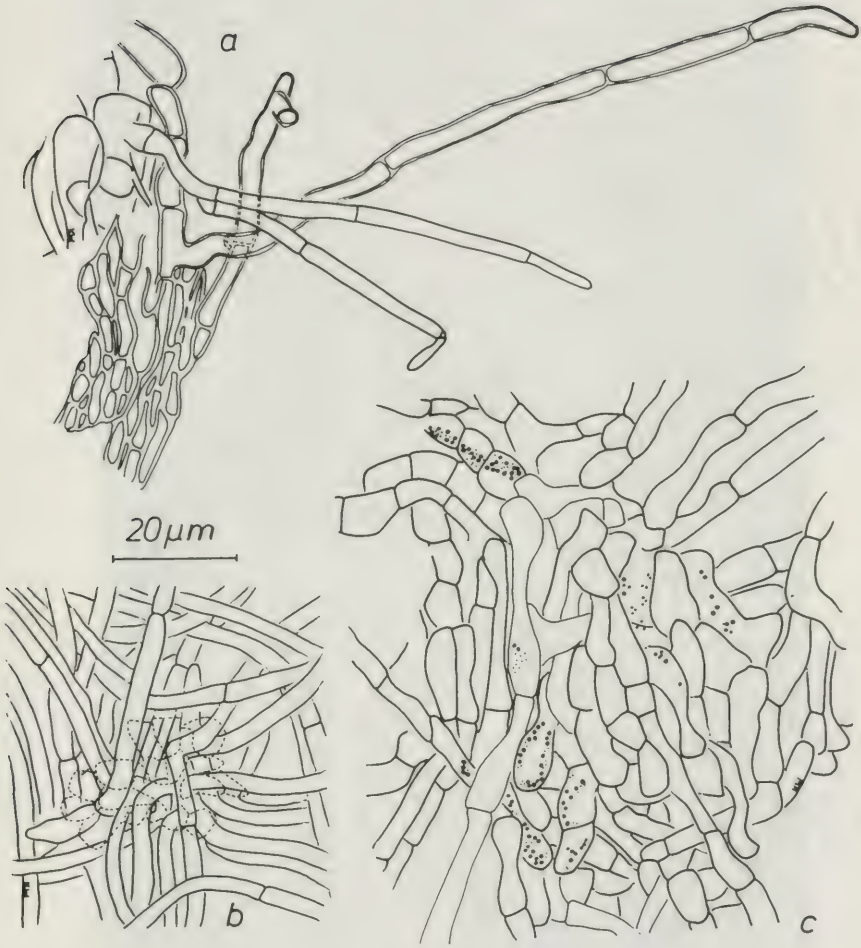


Abb. 2 - *Piceirhiza oleiferans*. - a. Abziehende Hyphen mit einer Schnalle. - b. Mantelaufsicht, Plectenchym aus nestförmig angeordneten, kurzzelligen Hyphen durch längere Hyphen voneinander getrennt, alle Zellen mit Öltröpfchen, nur an wenigen Stellen eingezeichnet. - c. Mittlere Mantelschicht, überwiegend pseudoparenchymatisch, jedoch stellenweise plectenchymatisch, alle Zellen mit Öltröpfchen, nur an wenigen Stellen eingezeichnet. (Abb. a von WA2; Abb. b-c von WA1).

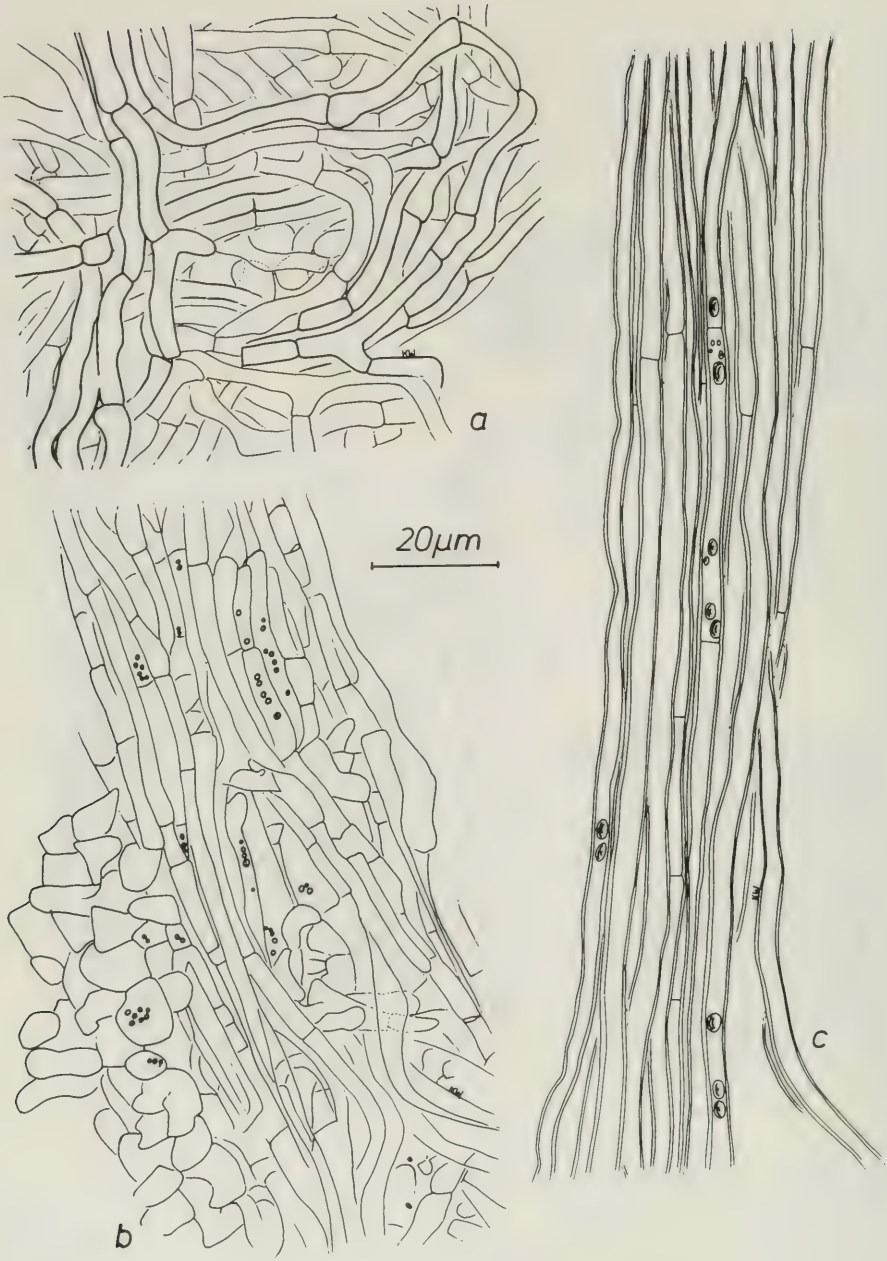
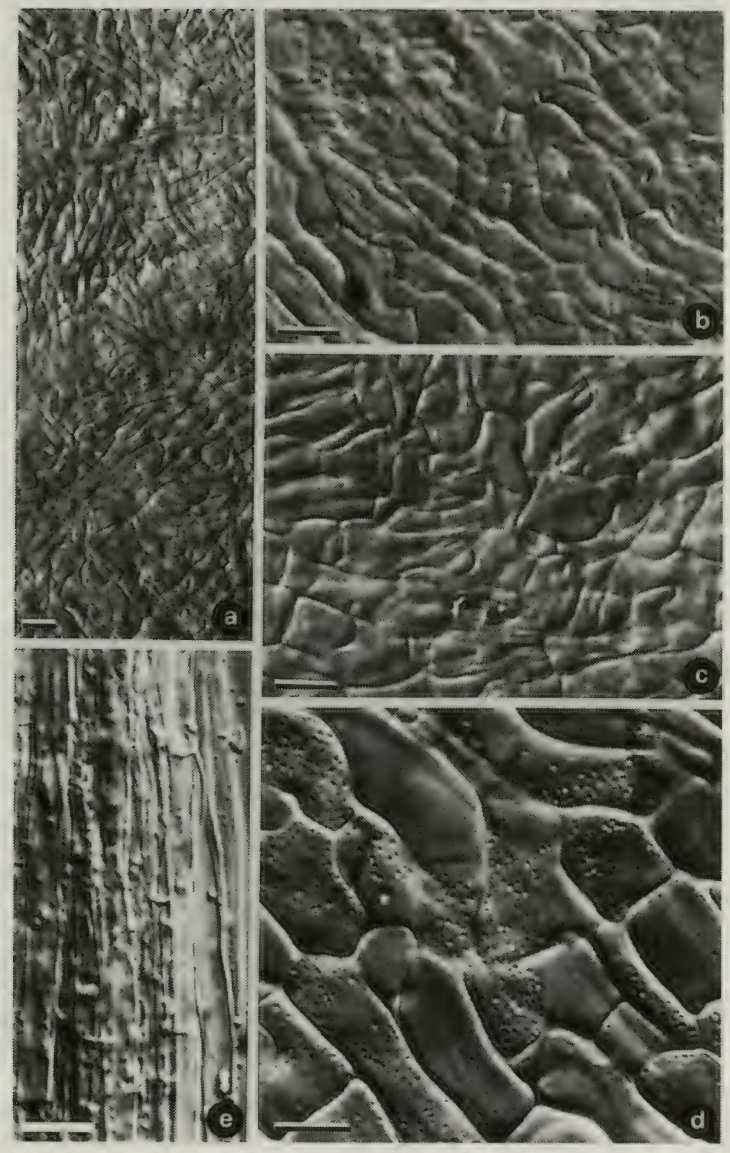
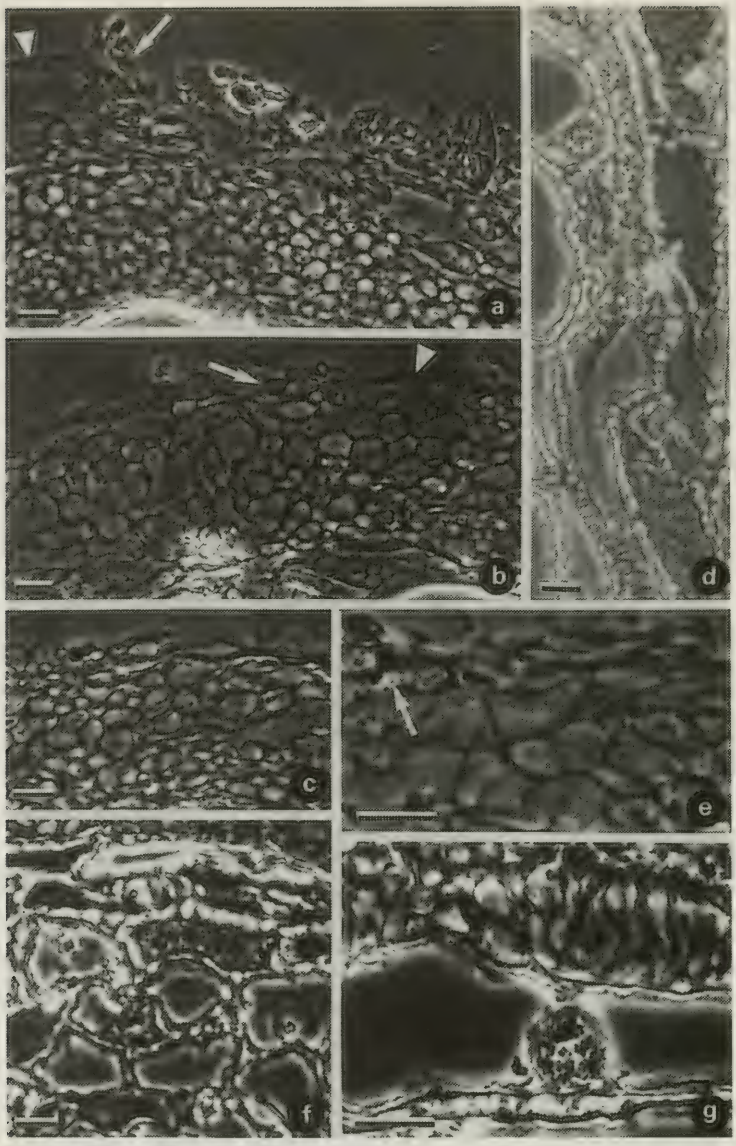


Abb. 3. - *Piceirhiza oleiferans*. - a. Mantelinnenfläche, dichtes Plectenchym mit Inselbildung aus kurzen Zellen. - b. Mantelinnenfläche, dichtes Plectenchym mit Inseln aus kurzen, breiten Zellen und langgestreckten Hyphen, alle Zellen mit Öltröpfchen, nur teilweise eingezeichnet. - c. Rhizomorphe, alle Hyphen gleichgestaltet, alle Zellen mit Öltröpfchen, nur teilweise eingezeichnet. (Abb. a, b von WA1; Abb. c von WA2).



Tafel 1. - *Piceirhiza oleiferans*. - a. Mantelinnenfläche, sternförmige Anordnung der Hyphen, ausgehend von Nestern kurzer Zellen. - b. Mantelaufsicht. - c. Flächenansicht mittlerer Mantelschicht. - d. Flächenansicht mittlerer Mantelschicht, Zellen mit Öltröpfchen. - e. Rhizomorphe, Aufsicht. (Abb. a-d von WA1; Abb. e von WA2; Meßstrich = 10 µm).



Tafel 2. - *Piceirhiza oleiferans*. - a. Querschnitt, von abziehenden Hyphen (Pfeilkopf) und häufchen-(nest-)förmigen Ansatzstellen (Pfeil) bis Mantelinnenseite nahe Tanninzellen. - b. Längsschnitt, von abziehenden Hyphen (Pfeilkopf) und häufchen-(nest-)förmigen Ansatzstellen (Pfeil) bis Mantelinnenseite nahe Tanninzellen. - c. Längsschnitt, Mantel von Außenseite (oben) bis Innenseite (unten), Schichtung des Mantels deutlich erkennbar. - d. Längsschnitt, Hartigsches Netz von Tanninzellen (rechts) bis Mitte der Rinde. - e. Längsschnitt, Mantelhyphen mit Öltröpfchen (Pfeil). - f. Querschnitt, Hartigsches Netz von Tanninzellen (oben) bis Endodermis. - g. Längsschnitt, Hartigsches Netz in Aufsicht neben Rindenzelle mit Kern. (Abb. a-c, e-g von WA1; Abb. d von WA2; Meßstrich = 10 µm).

Ektomykorrhizen von Dermocybe cinnamomeolutea (Cortinariaceae) und Tricholoma acerbum (Tricholomataeceae) *)

von

K. WALLER & R. AGERER

Abstract:
WALLER, K. & AGERER, R.: Ectomycorrhizae of Dermocybe cinnamomeolutea (Cortinariaceae) and Tricholoma acerbum (Tricholomataceae). - Sendtnera 1: 23 - 38. 1993. ISSN 0944-0178.

Ectomycorrhizae of *Dermocybe cinnamomeolutea* on *Salix* spec. and of *Tricholoma acerbum* on *Fagus sylvatica* are comprehensively described, compared with other ectomycorrhizae of these genera, and a key for determination of these ectomycorrhizae is provided.

Von mehreren Arten der Gattung *Tricholoma* sind bereits die Ektomykorrhizen beschrieben (BRAND 1991, TREU 1990, UHL 1988). Auch viele Arten der Gattung *Dermocybe* sind schon hinsichtlich ihrer Ektomykorrhizen bekannt UHL (1988). Im folgenden wird jeweils eine weitere Art der beiden Gattungen, nämlich *Dermocybe cinnamomeolutea* und *Tricholoma acerbum* charakterisiert und eine vergleichende Diskussion der Arten vorgenommen.

Methoden zur Isolierung der Ektomykorrhizen aus dem Boden, zur Vorgehensweise bei der Analyse und wichtige Merkmale wurden bereits zusammengefaßt (AGERER 1991), die verwendeten Termini sind in einem Glossar erklärt (AGERER 1987-1992). Für die vorliegenden Beschreibungen von Schnitten wurde in Historesin eingebettetes Material verwendet (AGERER 1991).

Dermocybe cinnamomeolutea (Orton) Moser an **Salix spec.**

Referenzbeleg: Deutschland, Rheinland-Pfalz, Eifel, Kreis Daun, Stohmer Maarchen, leg. *R. Agerer*, 29.09.1987, Mykorrhiza RA 11280a, in Herb. R. AGERER (M).

HABITUS (Abb. 1a)

Irregulär pinnat; Achsen gebogen bis gewunden, diese oft durch sehr dichte Hyphenmatten

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* Gilt als Studien an Ektomykorrhizen XLVIII. - Studien an Ektomykorrhizen XLVII: WALLER et al. (1993).

miteinander verbunden. Mykorrhizensystem bis 14 mm lang, Achse 0,3-0,5 mm im Durchmesser; Seitenäste bis 7 mm lang, 0,15-0,35 mm im Durchmesser. Mantel gelblich bis weißlich-ocker mit silbriger Oberfläche, Oberflächenstruktur stellenweise strähnig; Mantel von dicht bis locker wolligem Hyphennetz zum Teil wattebauschartig umgeben, Hyphen Matten bildend. Rhizomorphen sehr häufig, von allen Teilen des Mantels abziehend, am Mantel ± entlanglaufend, mit flachen Ab- und Aufzweigungen, benachbarte Mykorrhizen verbindend; im Querschnitt rund bis flach, Rand ± wollig ausgefranst; weiß bis leicht gelb oder ockerfarben, 15-150 µm im Durchmesser.

ANATOMIE (FLÄCHENANSICHT)

M a n t e l (Abb. 2a, Tafel 1a) in Aufsicht plectenchymatisch, aus einem Netz zum Teil aufgeblähter Hyphen bestehend, im frischen Zustand mit stark lichtbrechenden, stäbchenförmigen bis 3 µm langen und sehr dünnen Einschlüssen, Manteltyp B (nach AGERER 1991); Hyphen gelblich mit feinwarziger Oberfläche, Schnallen tragend; Hyphenzellen 10-100 µm lang, 2,3-4 µm im Durchmesser, Aufblähungen bis 7µm, Zellwand 0,3 µm dick; Anastomosen mit Kontaktschnallen. Fließender Übergang zur Mittelschicht (Abb. 2a, Tafel 1b, c) mit verschleimter Matrix, aus runden bis ovalen Zellen, 2,2-6 µm im Durchmesser, Zellwand 0,3 µm dick; von gelblichen Hyphenzellen durchzogen, diese 10-40 µm lang, 2,3-4,5µm im Durchmesser, Zellwand 0,5 µm dick. Fließender Übergang zur dicht plectenchymatischen bis pseudoparenchymatischen Innenseite (Abb. 2a, Tafel 1d) mit verquollener Matrix, aus runden bis ovalen Zellen; 2-5 (10) µm im Durchmesser, Zellwand 0,3 µm dick, Zahl der Zellen in 20 x 20 µm: 20-30. Mantel der Mykorrhizaspitze mit gleichem Aufbau.

A b z i e h e n d e H y p h e n (Tafel 2a,c,d) gelblich bis gelblich-ockerfarben, mit Schnallen, Oberfläche fein warzig; Hyphen größtenteils sehr lang, 2,3-4 µm im Durchmesser, Zellwand 0,3 µm dick, Anastomosen mit Kontaktschnallen.

R h i z o m o r p h e n (Abb. 1b, Tafel 2b) einfach gebaut, ohne Zentralhyphen, vielfach verzweigt, abziehende Hyphen häufig, Rhizomorphentyp A (nach AGERER 1991); Hyphen gelblich, fein warzig, mit Schnallen; Septenabstand 18-100 µm, Hyphenzellen 1,5-4µm im Durchmesser, Zellwand 0,3 µm, Anastomosen mit Kontaktschnallen.

ANATOMIE (QUERSCHNITT)

M a n t e l (Tafel 2a,d) keine Schichtung erkennbar, 25-35 µm dick, in den äußeren 10µm auflockernd und in breite Schicht abziehender Hyphen übergehend. Zellen rund bis quer-oval, 3-8 (12) µm im Durchmesser, abziehende Hyphen 3-5 µm im Durchmesser, Zellwände dünn. Reste der Calyptrazellen entlang des Querschnitts einen Ring im Mantel um die Wurzel bildend.

H a r t i g s c h e s N e t z (Tafel 2c) paraepidermal aus einer Hyphenreihe bestehend, 3 µm dick; Hyphen der Länge nach zwischen die Cortexzellwände wachsend.

C o r t e x z e l l e n (Tafel 2c) mit Hartigschem Netz rund bis leicht radial-oval; Zellen tangential (9) 12-14 (29) µm, im Durchschnitt 14 µm (CCt); radial (11) 17-25 µm, im Durchschnitt 20 µm, durchschnittlicher Quotient tangential : radial 0,7 (CCq).

ANATOMIE (LÄNGSSCHNITT)

M a n t e l (Tafel 2d) keine Schichtung erkennbar, 25-35 µm dick, in den äußeren 10 µm auflockernd und in breite Schicht abziehender Hyphen übergehend. Zellen rund bis leicht oval, ab Mantelmitte von längs laufenden Hyphen durchzogen 2-8 (12) µm im Durchmesser, Zellwand dünn; abziehende Hyphen meist tangential verlaufend, 3-5 µm im Durchmesser, mit Schnallen; Anastomosen mit Kontaktschnallen. Reste der Calyptrazellen dicht entlang der Wurzel liegend. Mantel der Mykorrhizaspitze 15-20 µm dick; Innenseite aus ovalen, selten runden Zellen, Zellabmessung (1)4x2 µm, darüber periklin längs orientierte Hyphen, 1-2 µm im Durchmesser, Zellwände dünn.

H a r t i g s c h e s N e t z (Tafel 2d) paraepidermal aus einer Hyphenreihe bestehend, 3 µm breit; Hyphen der Länge nach zwischen die Cortexzellen wachsend; Hartigsches Netz vom Palmetti-Typ, Loben 2-3 µm breit.

C o r t e x z e l l e n (Tafel 2d) mit Hartigschem Netz rund bis tangential langgestreckt; Zellen tangential (29) 27-40 (44) µm, im Durchschnitt 30 µm (CCt); radial 18-25 µm im Durchschnitt 21 µm, durchschnittlicher Quotient tangential : radial 1,5 (CCq).

FARBREAKTIONEN DES MANTELS MIT VERSCHIEDENEN REAGENZIEN

Mantel und Rhizomorphen: Säurefuchsin: keine Reaktion (= kR); Anilin: Zellwand, besonders Septen violett; nach Auswaschen mit Wasser verschwindet die Farbe; Brillantkresylblau: kR; Milchsäure-Baumwollblau: kR; Ethanol 70%: kR; Eisensulfat: kR; Formol 40%: kR; Guaiak: kR; Kalilauge: kR; Milchsäure: kR; Phenol: kR; Phenol-Anilin: kR; Rutheniumrot: kR; Sufovanillin: kR; Sudan II: ockerbraun. Ganze Mykorrhiza: Eisensulfat: abziehende Hyphen und Rhizomorphen braun.

AUTOFLUORESZENZ

Ganze Mykorrhiza unter der UV-Handlampe 254 nm: keine; 366 nm: keine. Längs- und Querschnitte im Fluoreszenz-Mikroskop: UV-Filter (340-380 nm): Mantelaußenseite blau, Innenseite creme-farben; Blau-Filter (450-490 nm): Außenseite dunkel rot-braun, Innenseite gelb; Grün-Filter (530-560 nm): rot.

KERNFÄRBUNG (mit Karminessigsäure)

Zwei Kerne pro Zelle, 2-3 µm im Durchmesser, rund bis oval; Kerne bereits ohne Färbung sichtbar.

UNTERSUCHTES MATERIAL

Referenzbeleg. - Die Identifizierung erfolgte durch Auffinden mehrerer Rhizomorphen-Verbindungen zwischen Fruchtkörperbasis und Ektomykorrhizen.

DISKUSSION

Mykorrhizen der Gattung *Dermocybe* in der Literatur

Mykorrhizen verschiedener Arten der Gattung *Dermocybe* wurden besonders in den letzten Jahren von mehreren Autoren bearbeitet. Detaillierte Beschreibungen der Ektomykorrhizen von *D. cinnamomea (Picea abies)* erstellten MASUI (1927), AGERER (1987 a) und GRONBACH (1988). *D. sanguinea*-Mykorrhizen (*Picea abies*) sind erstmals von AGERER (1987 a) untersucht und denen von *D. cinnamomea (Picea abies)* gegenübergestellt worden. Mykorrhizen von *D. crocea (Pinus silvestris)* und *D. palustris (Pinus mugo)* wurden von UHL & AGERER (1987) beschrieben und miteinander verglichen. *D. semisanguinea*-Mykorrhizen *(Pinus silvestris)* und solche von *D. holoxantha (Pinus silvestris)* wurden von UHL (1988 a) charakterisiert. Eine Beschreibung von *D. phoenicea* an *Betula pendula* erfolgte durch CUVELIER (1990). Darüberhinaus beschrieb ZAK (ZAK 1974) eine arbutoide Mykorrhiza von *D. zakii* an *Arbutus menziesii.*

Der nachfolgende Bestimmungsschlüssel stellt die Unterschiede zwischen den Ektomykorrhizen der bisher bearbeiteten Arten zusammen.

Bestimmungsschlüssel der Ektomykorrhizen der Gattung Dermocybe

1 Mykorrhiza mehr oder weniger rötlich 2
- Mykorrhiza mehr oder weniger gelblich 3
2 Mykorrhiza graubraun mit rötlichen Tönen; Rhizomorphenhyphen (2) 3-6 µm im Durchmesser *D. phoenicea* (Bull.: Mre.) Mos.
- Mykorrhiza nicht graubraun; Rhizomorphenhyphen 3-4 µm im Durchmesser *D. sanguinea* (Wulf.: Fr.) Wünsche
3 Zellwand der Hyphen 0,5 µm dick 4
- Zellwand dünner (0,2-0,4 µm) 5
4 Einige Hyphen der Manteloberfläche mit braunem Zellinhalt, deutliche Braunfärbung mit Melzers Reagenz; Hyphen nahe der Septen nicht aufgebläht *D. cinnamomea* (L.: Fr.) Wünsche
- Ohne solche Hyphen; Hyphen nahe der Septen etwas aufgebläht *D. palustris* (Mos.) Mos.
5 Hyphen bis 3 µm im Durchmesser *D. crocea* (Schff.) Mos.
- Hyphen dicker, bis 5 µm; Hyphen der Rhizomorphen auch bis 5,5 µm 6
6 Autofluoreszenz der ganzen Mykorrhiza bei UV 254 nm kräftig gelb bis orange; Hyphen mit Inkrustationen *D. semisanguinea* (Fr.) Mos.
- Keine Autofluoreszenz der ganzen Mykorrhiza; Hyphen ohne Inkrustationen 7
7 Hyphen feinwarzig *D. cinnamomeolutea* (P.D.Orton) Mos.
- Hyphen nicht feinwarzig *D. holoxantha* Gruber & Mos.

Gemeinsame Merkmale der Ektomykorrhizen der Gattung *Dermocybe* sind eine meist schwach rötliche bis weißlich-gelbliche Färbung mit silbrigem Schimmer und eine strähnige Struktur des Mantels. Die Achsen sind gebogen bis gewunden und Ansatzstelle zahlreicher Rhizomorphen. Die einfach organisierten Rhizomorphen weisen bei *D. crocea, D. holoxantha, D. palustris* und *D. semisanguinea* einen Dimorphismus auf (UHL & AGERER 1987, UHL 1988 c). UHL (1988 c) vermutete, daß möglicherweise auch bei Rhizomorphen von *D. cinnamomea* und *D. sanguinea* ein solcher Dimorphismus zu finden sei, jedoch bei damaligen Untersuchun-

gen nicht beachtet wurde. Ebenso könnte es sich bei den Rhizomorphen von *D. cinnamomeo-lutea* verhalten, die zur Bearbeitung bereits als fixiertes Material vorlagen.

Der Mantel in Aufsicht war in allen acht Fällen plectenchymatisch. Kontaktschnallen wurden immer beobachtet, doch tritt dieses Merkmal auch in den Subgenera *Telamonia* und *Leprocybe* der Gattung *Cortinarius* auf (AGERER 1987 b).

Tricholoma acerbum (Bull.: Fr.) Quél. an **Fagus sylvatica** L.

Referenzbeleg: Deutschland, Baden-Württemberg, Tübingen - Pfrondorf, Eichen-, Buchen-, Hainbuchenmischwald, 27.10.1990, Mykorrhiza RA 11589, in Herb. R. AGERER (M).

HABITUS (Abb. 3a)

Monopodial-pyramidal, manchmal etwas irregulär; Achse gerade bis leicht gebogen oder leicht gewunden, Seitenäste gerade bis gebogen. Mykorrhizensystem bis 9,5 mm lang, Achse 0,3-0,5 mm im Durchmesser; Seitenäste bis 3 (5,5) mm lang und 0,2-0,3 mm im Durchmesser. Mantel weiß, silbrig schimmernd; Wurzel durch den Mantel scheinend, wenn Luft durch Wasser ersetzt wird; Oberfläche dicht strähnig, Hyphenbündel netzartig den Mantel umgebend. Abziehende Hyphen häufig, den Mantel netzartig umgebend. Rhizomorphen farblos, sehr häufig, von allen Teil des Mantels abziehend, jedoch nicht von der Spitze; ± rundlich, mit glattem Rand, strauchförmig verzweigt.

ANATOMIE (FLÄCHENANSICHT)

M a n t e l (Abb. 3b, Tafel 3a) in Aufsicht plectenchymatisch, aus einem lockeren Netz schwach gelber bis schwach ockerfarbener Hyphen bestehend; Oberfläche der Hyphen feinwarzig, Manteltyp A (nach AGERER 1991); Zellen 15-100 µm lang, 4-5 µm im Durchmesser, Zellwand 0,3 µm dick. Mittelschicht (Tafel 3c) plectenchymatisch, aus einem stärker verflochtenen Netz membranär schwach gelber bis ockerfarbener Hyphen; Zellen 15-100 µm lang, 4-5 µm im Durchmesser, Zellwand 0,5 µm dick. Mantelinnenseite (Abb. 3c, Tafel 3c) dicht plectenchymatisch bis pseudoparenchymatisch, aus länglichen, gebuchteten Zellen bestehend, epidermoid-ähnlich, an Palmetti-Muster erinnernd, von wenigen längeren Hyphen durchzogen; Zellwände 0,5 µm dick; Zahl der Zellen in 20 x 20 µm: 13-17. Mantel der Mykorrhizaspitze mit gleichem Aufbau, Hyphenzellen 12-80µm lang, 2-3 µm im Durchmesser.

A b z i e h e n d e H y p h e n 100 µm und länger, 4-5 µm im Durchmesser, Zellwand 0,3 µm; Oberfläche fein warzig.

R h i z o m o r p h e n (Abb. 3d, Tafel 3d,e, 4c,d) hochorganisiert, irregulär monopodial-pyramidal verzweigt, mit Knoten an Verzweigungsstellen, Rand glatt, 25-400 µm im Durchmesser, Rhizomorphentyp F (nach AGERER 1991); aus mehreren, verzweigten, farblosen, fein rauhen Zentralhyphen, Septen selten fast aufgelöst, Hyphenzellen 55-180 µm lang, 7-18 µm im Durchmesser, Zellwand 0,8-1,5 µm, Rhizomorphen unter 25 µm Breite ohne dicke Zentralhyphen; umgebende Hyphen farblos, mit fein warziger Oberfläche, teilweise mit Schnallen, manchmal mit kristalloiden Strukturen im Cytoplasma; Hyphenzellen 20-160 µm lang, 2,5-5,5 µm im Durchmesser, Zellwand 0,6 µm, mit rückwärts gerichteten Verzweigungen; Anastomosen ohne Septen oder Schnallen.

ANATOMIE (QUERSCHNITT)

M a n t e l (Tafel 4a), keine Schichtung erkennbar, (8) 15-17 (50) µm dick, mit unterschiedlich dicker, lockerer Schicht abziehender Hyphen. Zellen quer und tangential verlaufend, 3-5 µm im Durchmesser, Zellwand 0,5 µm; abziehende Hyphen tangential und quer verlaufend, 3-5 µm im Durchmesser, Zellwand 0,5 µm. Reste der Calyptrazellen lang, dünn, fast durchgehend den Wurzelquerschnitt umgebend.

H a r t i g s c h e s N e t z (Tafel 4a)

Hartigsches Netz periepidermal, aus einer Hyphenreihe bestehend, 2-3 µm dick; Zellen rund, daraus blasige Haustorien in die äußeren Rindenzellen einwachsend.

C o r t e x z e l l e n (Tafel 4a)

Cortexzellen mit Hartigschem Netz leicht radial gestreckt; Zellen tangential 13-19 µm, im Durchschnitt 16 µm (CCt); radial (11) 19-23 (32) µm, im Durchschnitt 19 µm; durchschnittlicher Quotient tangential : radial 0,8 (CCq).

ANATOMIE (LÄNGSSCHNITT)

M a n t e l (Tafel 4b), keine Schichtung erkennbar, (8) 15-17 (59) µm dick. Zellen tangential und quer verlaufend, 3-5 µm im Durchmesser, Zellwand 0,5 µm; abziehende Hyphen quer und tangential verlaufend, 3-5 µm im Durchmesser, Zellwand 0,5 µm. Reste der Calyptrazellen lang, dünn, fast durchgehend sich an der Wurzel entlangziehend. Mantel der Mykorrhizaspitze mit gleichem Aufbau, 4-10 µm dick.

H a r t i g s c h e s N e t z (Tafel 4b)

Hartigsches Netz periepidermal, aus einer Hyphenreihe bestehend, 2-3 µm dick; Zellen rund, daraus blasige Haustorien in die äußeren Rindenzellen einwachsend; Hartigsches Netz vom Palmetti-Typ, Loben 1-1,3 µm breit.

C o r t e x z e l l e n (Tafel 4b)

Cortexzellen mit Hartigschem Netz radial, selten schräg gestreckt; Zellen tangential (10) 17-25 (30) µm, im Durchschnitt 17 µm (CCt); radial (25) 30-38 (43) µm, im Durchschnitt 34 µm; durchschnittlicher Quotient tangential : radial 0,5 (CCq).

FARBREAKTIONEN DES MANTELS MIT VERSCHIEDENEN REAGENZIEN

Nicht durchgeführt.

AUTOFLUORESZENZ

Längs- und Querschnitte im Fluoreszenz-Mikroskop: UV-Filter (340-380 nm): fahl-bläulich; Blau-Filter (450-490 nm): schwach gelb; Grün-Filter (530-560 nm): rot.

KERNFÄRBUNG (mit Karminessigsäure)

2 Kerne pro Zelle, 2-3 µm im Durchmesser, rund bis oval.

UNTERSUCHTES MATERIAL

Referenzbeleg. - Die Identifizierung erfolgte durch Auffinden mehrerer Rhizomorphen-Verbindungen zwischen Fruchtkörperbasis und Ektomykorrhizen.

Diskussion

Detaillierte Beschreibungen von *Tricholoma*-Ektomykorrhizen liegen von folgenden Arten vor: *Tricholoma aurantium* an *Picea abies* (UHL 1988a), *T. auratum* an *Pinus silvestris* (UHL 1988b), *T. imbricatum* an *Larix decidua* (TREU 1990), *T. flavobrunneum* an *Betula pendula* (UHL 1988a), *T. saponaceum* an *Picea abies* (UHL 1988a), *T. sciodes* an *Fagus sylvatica* (BRAND 1991), *T. sejunctum* an *Pinus strobus* (UHL 1988a), *T. sulphureum* an *Picea abies* (AGERER 1987c) und *T. vaccinum* an *Picea abies* (AGERER 1987c, BRUNNER et al. 1992, UHL 1988a). Unter Einschluß der vorliegend charakterisierten *T. acerbum* Ektomykorrhizen läßt sich der nachfolgende Bestimmungsschlüssel aufstellen.

Bestimmungsschlüssel der Ektomykorrhizen der Gattung Tricholoma

1 Rhizomorphen undifferenziert, d.h. alle Hyphen gleichgestaltet 2
- Rhizomorphen differenziert, d.h. wenigstens mit einigen Hyphen größeren Durchmessers 4
2 Anastomosen geschlossen (mit Septum = Kontakt-Septum) *Tricholoma sulphureum* (Bull.: Fr.) Kummer
- Anastomosen offen (ohne Septum) 3
3 Ohne Schnallen, abziehende Hyphen 3-4 µm im Durchmesser *Tricholoma sciodes* (Secr.) Mart.
- Mit Schnallen, abziehende Hyphen 3-6 µm im Durchmesser *Tricholoma sejunctum* (Sow.: Fr.) Quél.
4 Durchmesser der verdickten Zentralhyphen bis höchstens 10 µm, Septen nicht aufgelöst 5
- Durchmesser der verdickten Zentralhyphen 15 µm und mehr erreichend, Septen zumindest zum Teil aufgelöst 8
5 Hyphen mit Schnallen *Tricholoma imbricatum* (Fr.: Fr.) Kummer
- Hyphen ohne Schnallen 6
6 Dickere Hyphen nicht zentral angeordnet *Tricholoma auratum* (Paul.: Fr.) Quél.
- Dickere Hyphen zentral angeordnet 7
7 Hyphen mit nadelförmigen Inkrustationen *Tricholoma aurantium* (Schff.: Fr.) Ricken
- Hyphen mit gelben, unregelmäßig tropfenförmigen Inkrustationen *Tricholoma flavobrunneum* (Fr.) Kummer
8 Zellwand der Zentralhyphen bis 0,5 µm dick *Tricholoma saponaceum* (Fr.) Kummer
- Zellwand der Zentralhyphen bis 1,5 µm und dicker 9
9 An Laubbäumen *Tricholoma acerbum* (Bull.: Fr.) Quél.
- An Nadelbäumen *Tricholoma vaccinum* (Pers.: Fr.) Kummer

Für einige weitere Arten liegen Kurzbeschreibungen vor; zusammengefaßt durch UHL (1988 a) und BRAND(1991). Sie sind allerdings nicht geeignet, einen Vergleich zu obigen Arten durchzuführen.

Als gemeinsame Kennzeichen der Ektomykorrhizen aus der Gattung *Tricholoma* können nach GODBOUT & FORTIN (1985), UHL (1988a) und BRAND (1991) eine weißliche, gelbliche bis schwach bräunliche Färbung, ein silbriges Erscheinungsbild durch eingeschlossene Luft zwischen den Mantelhyphen und ein nach außen aufgelockerter, plectenchymatischer Mantel mit zahlreichen Rhizomorphen angesehen werden. Alle im Bestimmungsschlüssel erfaßten Arten zeigen in Aufsicht einen Hyphenmantel, mit ringförmiger Anordnung der Hyphen zumindest in mittleren bis inneren Lagen. Dies entspricht dem Manteltyp A nach AGERER (1991). Die Rhizomorphen-Organisation ist weniger einheitlich und umfaßt nach AGERER (1991) mit den Typen A, B, C, D, E, F mehrere Organisationsstufen.

Im Vergleich zu den *Tricholoma*-Arten zeigen die oben aufgeschlüsselten Ektomykorrhizen der Gattung *Dermocybe* einen einheitlichen Rhizomorphenbau (Typ A nach AGERER 1991).

Danksagung

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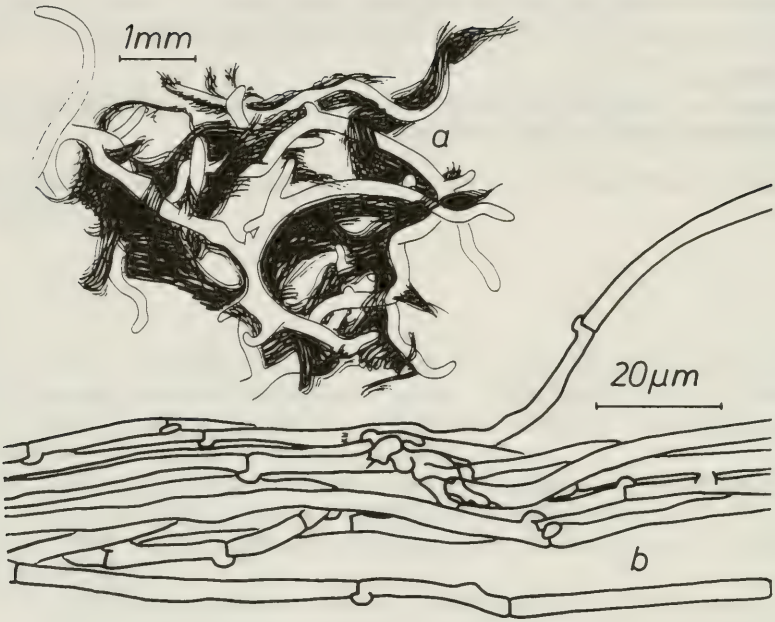


Abb. 1. - *Dermocybe cinnamomeolutea*. - a. Habitus, Ektomykorrhizen in Hyphenmatten eingebettet. - b. Rhizomorphe, alle Hyphen gleichgestaltet. (Alle Abb. von RA 11280a).

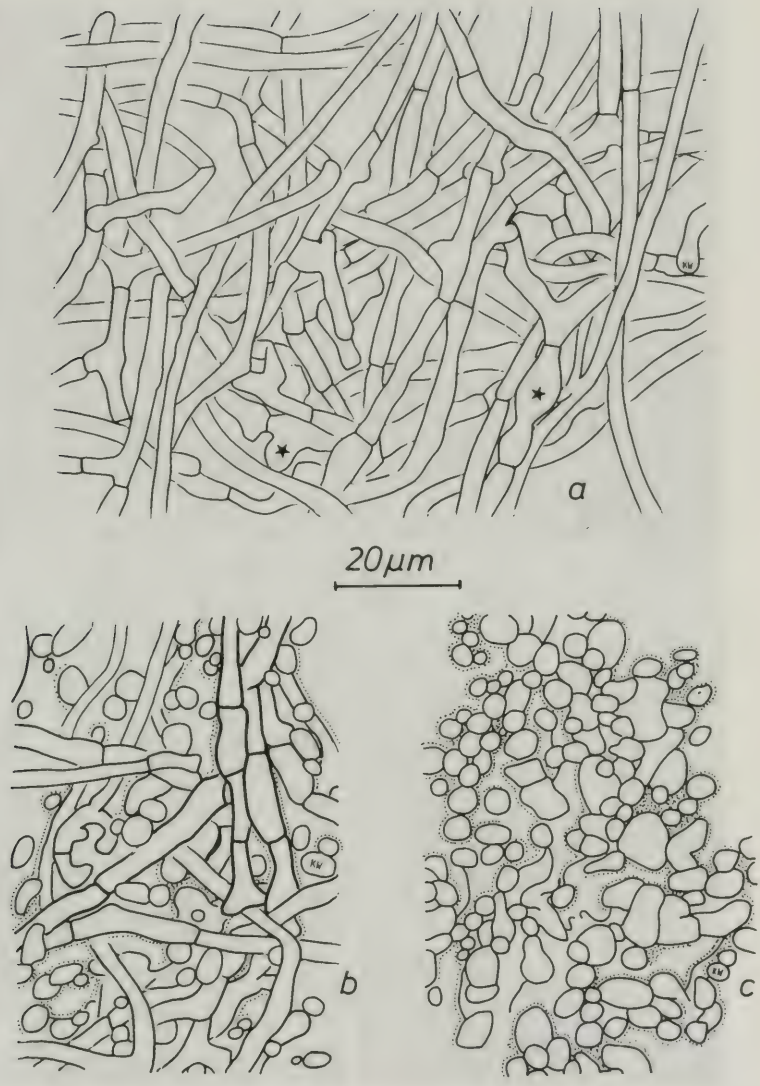
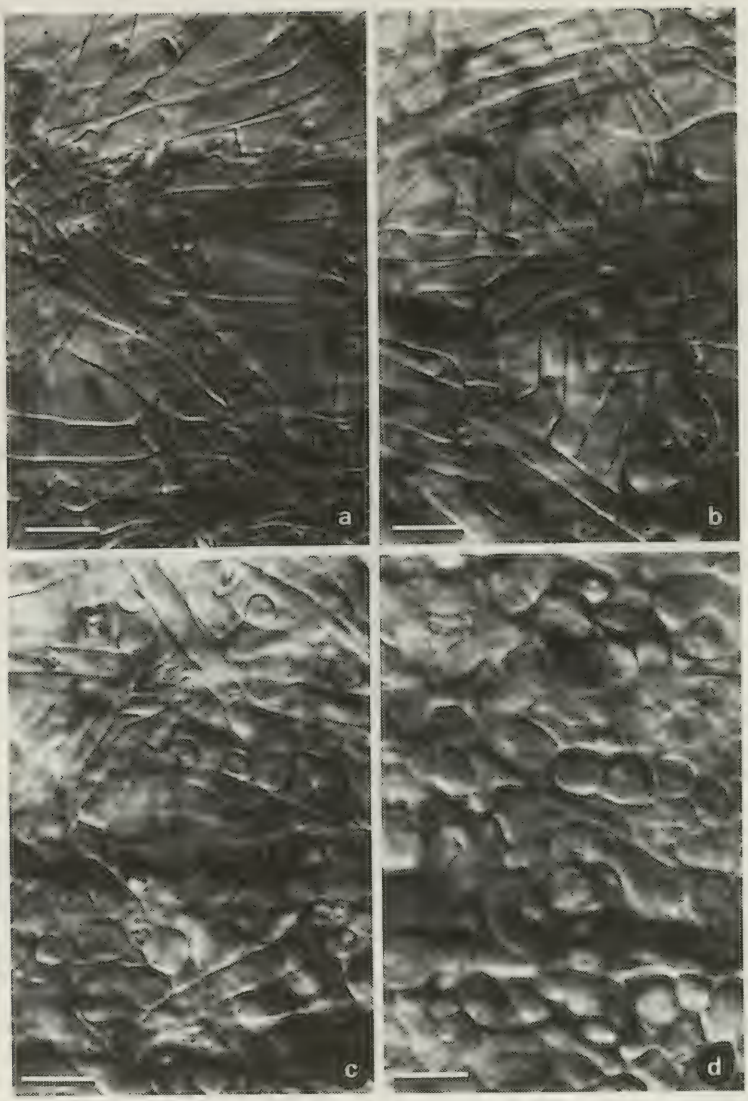
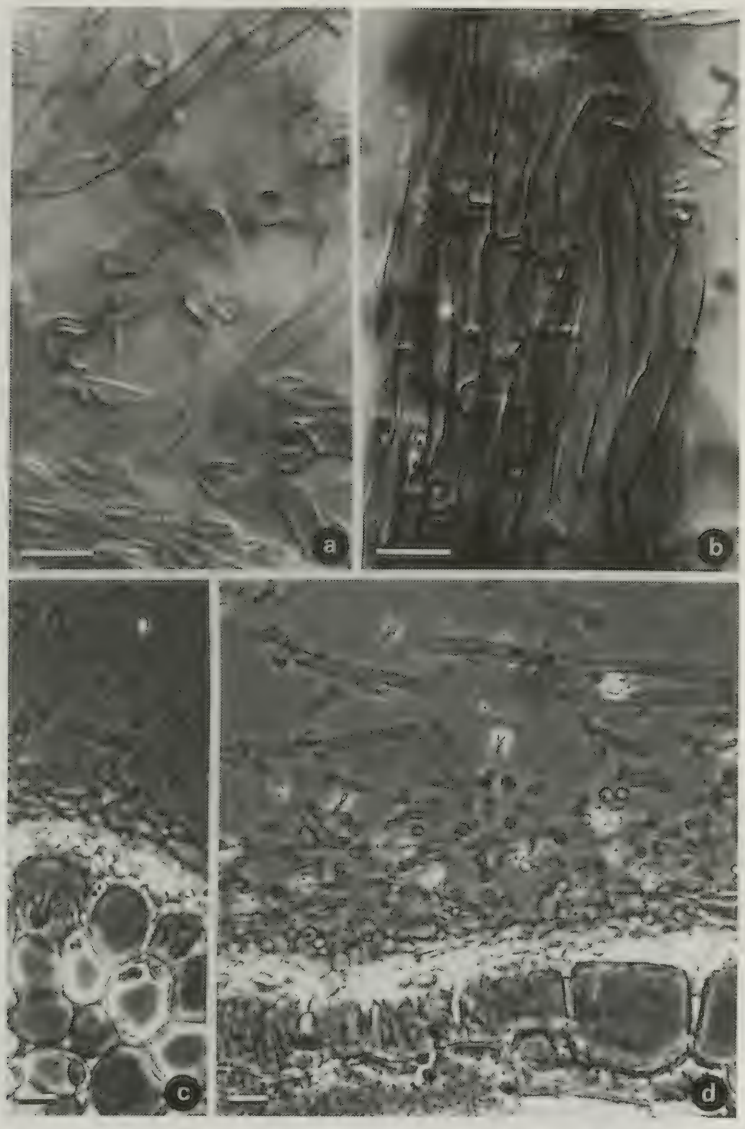


Abb. 2. *Dermocybe cinnamomeolutea* - a. Mantelaufsicht, Plectenchym aus netzartig angeordneten Hyphenbündeln, zum Teil mit aufgeblähten Abschnitten (siehe *). - b. Flächenansicht mittlerer Mantelschicht, dichtes Plectenchym aus langgestreckten Hyphen, dazwischen mit dichtliegenden, kurzen Zellen mit verquollenen Zellwänden. - c. Mantelinnenseite, dichtliegende runde Zellen mit verquollenen Zellwänden. (Alle Abb. von RA 11280a).



Tafel 1. - *Dermocybe cinnamomeolutea*. - a-d. Flächenansichten des Mantels, immer von der gleichen Stelle aus, jedoch auf verschiedene Lagen fokussiert. - a. Mantelaufsicht mit netzartig angeordneten Hyphenbündeln. - b. Etwas unter 'a'. - c. Etwas unter 'b', netzartige Anordnung der Hyphen in 'b' und 'c' noch deutlich erkennbar. - d. Mantelinnenseite aus meist rundlichen Zellen. (Alle Abb. von RA 11280a, Meßbalken = 10 µm).



Tafel 2. - *Dermocybe cinnamomeolutea*. - a. Mantel mit locker verwobenen, aber dicht stehenden abziehenden Hyphen. - b. Rhizomorphe im optischen Schnitt. - c. Querschnitt, von abziehenden Hyphen bis Rindenzellen nahe Endodermis. - d. Längsschnitt, von abziehenden Hyphen bis zum paraepidermalen Hartigschen Netz. (Alle Abb. von RA 11280a; Meßbalken = 10 µm).

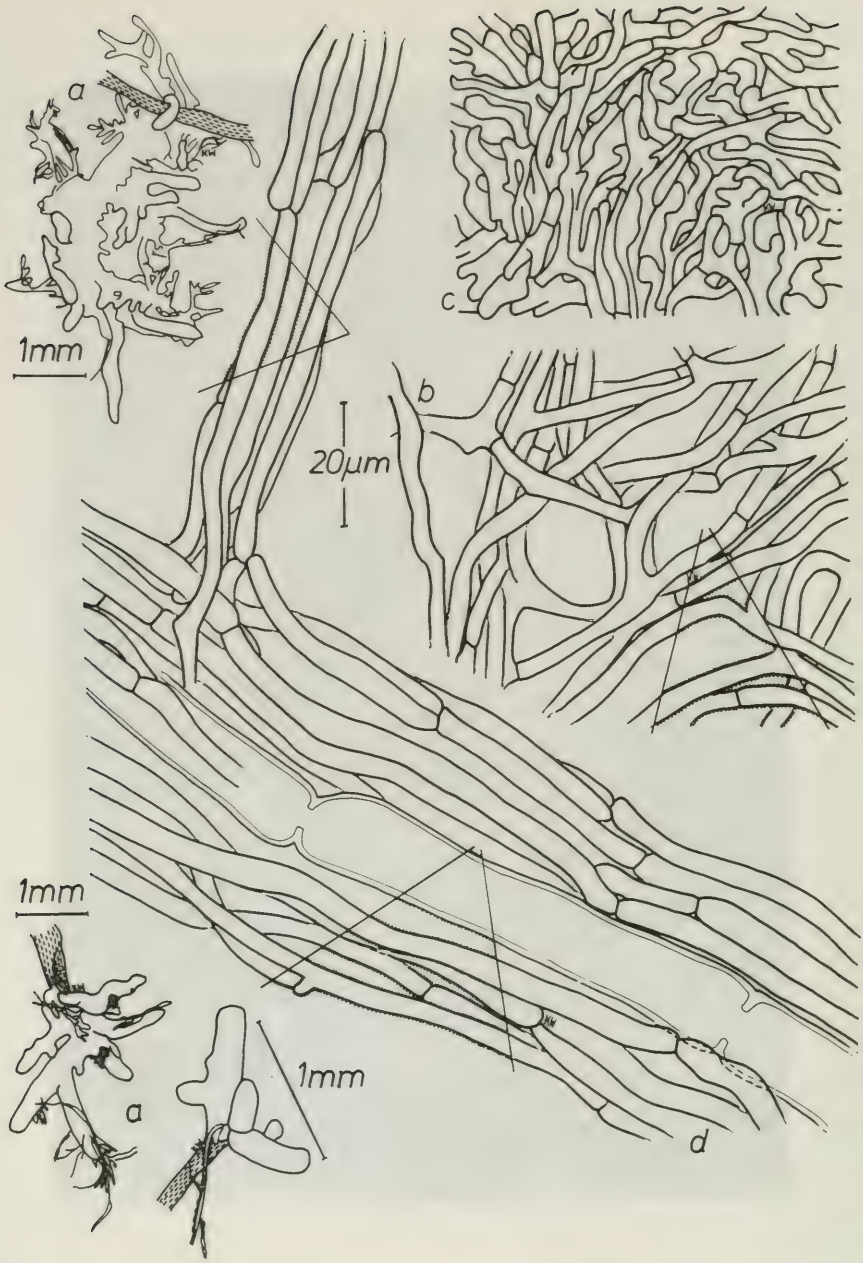
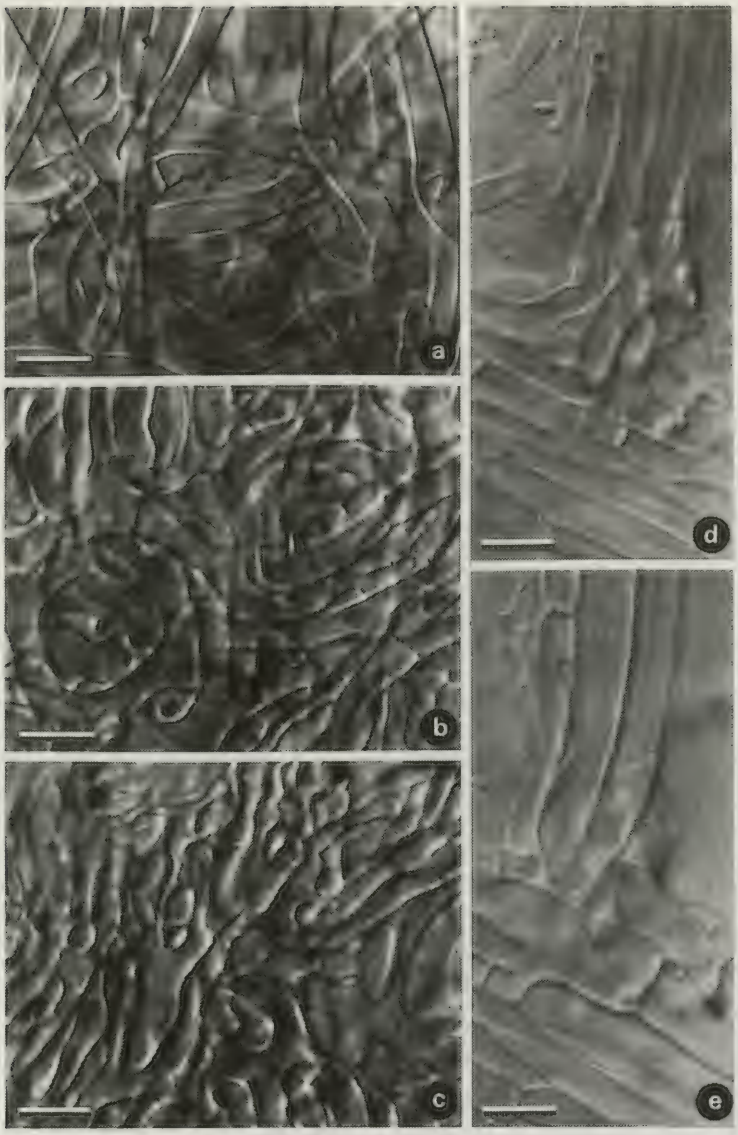
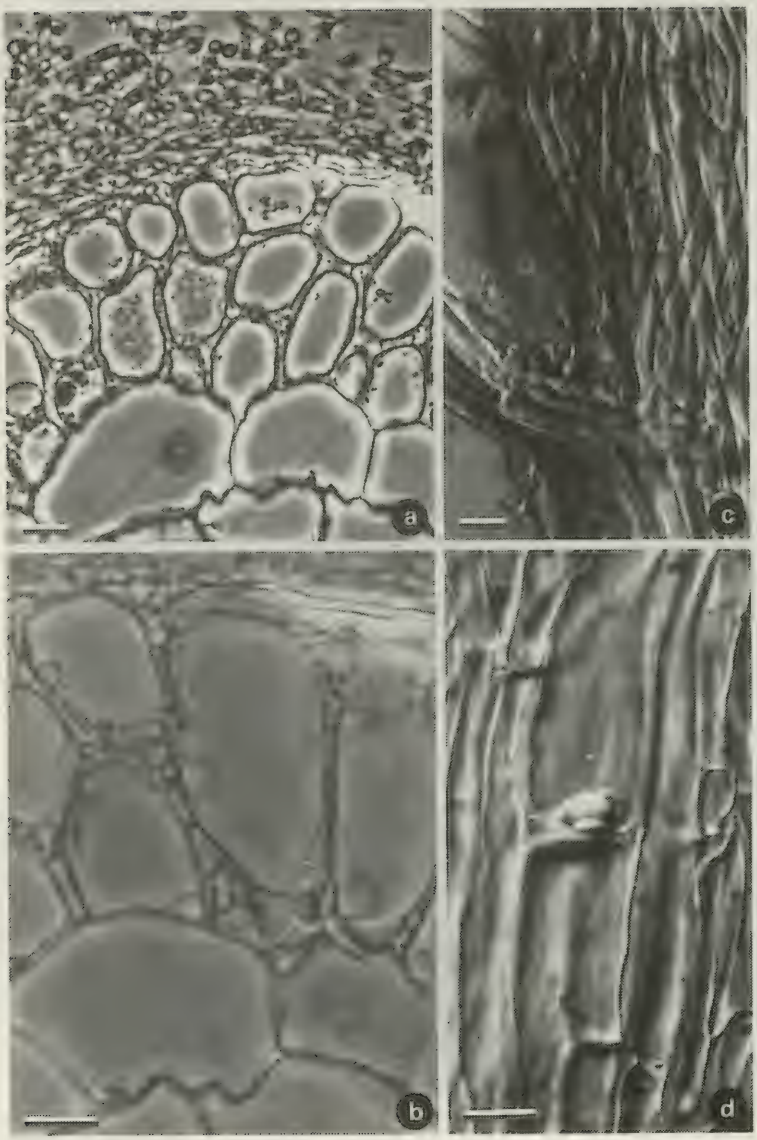


Abb. 3. - *Tricholoma acerbum*. - a. Habitus, Ektomykorrhizen in Netz aus Rhizomorphen eingebettet sowie mit einzelnen Rhizomorphen versehen. - b. Mantelaufsicht, lockeres Plectenchym aus netzartig angeordneten Hyphenbündeln, alle Hyphen feinwarzig (nur ausschnittsweise eingezeichnet). - c. Mantelinnenseite, dichtes Plectenchym aus unregelmäßig gestalteten Hyphen. - d. Sich verzweigende Rhizomorphe im optischen Schnitt, Zentralhyphe mit vergrößertem Septenporus, alle Hyphen feinwarzig (nur ausschnittsweise gezeichnet). (Alle Abb. von RA 11589).



Tafel 3. - *Tricholoma acerbum*. - a-c: Flächenansichten des Mantels immer von der gleichen Stelle aus, jedoch auf verschiedene Lagen fokussiert. - a. Mantelaufsicht, lockeres Plectenchym aus netzartig angeordneten Hyphenbündeln. - b. Mittlere Mantelschicht, dichteres Plectenchym aus netzartig angeordneten Hyphen. - c. Mantelinnenseite, dichtes Plectenchym aus unregelmäßig gestalteten Hyphen. - d-e: Sich verzweigende Rhizomorphe. - d. Verzweigungsstelle im optischen Schnitt. (Alle Abb. von RA 11589; Meßbalken = 10 µm).



Tafel 4. - *Tricholoma acerbum*. - a. Querschnitt, von abziehenden Hyphen bis Rindenzellen nahe Endodermis, mit scheinbar mehrschichtigem Hartigschen Netz. - b. Längsschnitt, von Mantelinnenbereich bis Rindenzellen, Hartigsches Netz periepidermal. - c. Aufsicht auf Verzweigungsstelle einer dickeren Rhizomorphe. - d. Rhizomorphe im optischen Längsschnitt, Zentralhyphe mit kristallartiger Struktur nahe Septum. (Alle Abb. von RA 11589; Meßbalken = 10 µm).

Ptilotus humifusus, a new species of Amaranthaceae from Queensland

by

G. BENL

Abstract:
BENL, G.: Ptilotus humifusus, a new species of Amaranthaceae from Queensland. - Sendtnera 1: 39 - 44. 1993. ISSN 0944-0178.

A new *Ptilotus* from Queensland, *P. humifusus* Benl sp. nov., is described and figured with a photograph of the holotype and analytical drawings of the flower. Type specimens are cited and the new taxon is compared with *P. procumbens* Benl, its closest congener.

Ptilotus humifusus Benl sp. nov. (Figs. 1 and 2)

Herba annua pluricaulis mox procumbens. Caules usque ad 35 cm et ultra graciles caespitosi, e radice fusiformi orientes, primo erecti dein patentes, (glauci-)virides, lineis pallidioribus partim rubescentibus angulati-striati, ad circa 20 cm longi, parce ramosi atque foliati; in statu juvenili pubescentes, pilis albidis distincte nodulosis dense induti dein glabrescentes. Rami laterales divergentes, summi apicem caulis superantes, vetustiores pedunculos formantes et in rhachides spicarum transeuntes. Folia coriacea integerrima; radicalia plus minusve deficientia. Folia caulina alterna ad circa 4,5 x 0,6 cm, basi petioliformi (sub)sessilia; lamina (lineari-) lanceolata vel anguste elliptica breviter aristata, primo utrimque villosa (pilis ut in caulibus) mox glabrata, nervo mediano subtus conspicue prominenti. Spicae confertiflorae solitariae, caules ramosque terminantes, juveniles conicae circiter 1 cm diametro, florentes apiculati-cylindraceae, in holotypo usque ad 2,7 cm longae; rhachis pilis nodulosis tomentosa. Flores breviter pedicellati ad 50 et ultra congesti, albidi-pilosi visu violacei-rosei denique pallescentes. Bracteae bracteolaeque hyalino-scariosae, glaberrimae, superstites, inaequales: bracteae ovati- lanceolatae; bracteolae maiores subcordati-orbiculares, perianthio arcte appressae. Perianthium 5-partitum circa 6 mm longum, primo (rigidi-)erectum demum tepalis divergentibus campanulati-patens, apicibus nudis tepalorum lucidum, ima basi extus hirsuta contractum. Perianthii segmenta libera, inferne distincte tricostata, superne marginibus scariosis late limbata, juvenilia manifeste bicolorata: areola mediana incrassata nervis lateralibus exacte circumscripta atropurpurea demum viridula; margines in apice confluentes laete purpureae ad (violacei-)roseae, post anthesin dilute stramineae. Tepala omnia in dorso villosi-plumosa - pubescentia apices vix attingente -, pilis strictis oblique erectis diversiformibus, in parte supera spinulosi-articulatis, in parte infera brevioribus obscure nodulosis; 2 exteriora linearia, apice truncato et erosi-denticulato, intus glaberrima; 3 interiora lineari-subulata haud breviora at angustiora (sub)acuta (apice interdum leviter incurvato), intus inferne pilis crispis tenuiter articulatis inter se intricatis obsessa. Stamina 5 aequalia fertilia; filamenta ad circiter 2,3 mm longa ligulata, inferne sensim ad 0,2 mm dilatata, in cupulam humilem imae basi

perianthii tantum insidentem transeuntia; pseudostaminodia interjecta nulla; antherae ellipsoideae dilute flavae. Gynoecium omnino glabrum; ovarium subclavatum sessile, circa 1,2 mm longum; stylus indivisus longior gracilis rectus excentricus; stigma capitellatum papillosum.

Species nova ad *Ptilotum procumbentem* Benl appropinquans, sed haec species ob spicas maturas conicas, bracteas fuscas pilosas, tepala in apice recurvata, ob 4 stamina tantum perfecta, cupulam staminalem nimis longam et stylum brevem a *Ptiloto humifuso* manifeste differt.

Holotypus: Warrego Region, 40 km S of Cunnamulla, 145°44'E, 28°19'S, Qld, 29 July 1983, P. *E. Conrick 1484* (AD 98413311, phot. M; isotypi: AD, CANB, M).

Mat-forming ephemeral herb (Fig. 1) of spreading habit to c. 40 cm across, closely pubescent in vegetative parts and outer floral organs when young. Up to about 35 shoots arising tuft-like from a slender tap-root of c. 5 mm in diameter, at first upright then sprawling to form a rosette and curved slightly upwards at their floriferous tips; tenuous by c. 1 to 2 mm thick near ground-level, attaining lengths of up to and over 20 cm when fully grown, greyish green turning glaucous-green, finely striate with paler (sporadically reddish-tinged) angular ribs, evenly clothed with a white indument of straight to slightly curved nodulous hairs 0,8-1,1 mm long later confined to apical portions and leaf-axils only. The (semi-)prostrate stems simple or openly branched, sparsely leafy throughout. Branches up to 5 (6) per stem and to c. 12 cm long, divaricate or ascending, obtusely 4- to 6-angled and hairy like main stem. Apices of stems, branches and branchlets always developing peduncles and rachises of inflorescences, but branchlets sparse in present material. Leaves of firm texture, entire; radical ones lanceolate, to c. 4,8 cm long and 0,4 (-0,6) cm broad, soon withering, hence inconspicuous or wanting in mature plants. Cauline leaves alternate, c. 10 to 15 all along stems and branches, (0,6-) 1-2,5 (-3,0) cm apart, mostly narrower than basal leaves, 1,8-4,5 x 0,12-0,6 cm, often patent, sometimes ascending from prostrate stems. Blade (narrowly to oblong-)lanceolate or narrow-elliptic, often reddish pointed with a small colourless arista of 0,8-1 mm, sessile or occasionally subsessile with a shortly decurrent petiole, chartaceous to thickly coriaceous, deep to grey-green, later appearing slightly glaucescent on both surfaces, sometimes reddish-tinged on almost parallel margins, evenly pubescent (with hairs as for stems but less dense) on either side only when young, soon glabrescent except in axils, where dense tufts of hairs appear when a new branchlet is sprouting; pale midvein distinctly raised beneath. Fluffy flower spikes numerous, about 30 to 50 per plant, always terminal and solitary, mostly borne upturned at apices of procumbent peduncles, densely flowered and compact for the whole length, initially cone-shaped, then lengthening to short-cylindric with a conoid top, attaining 2,7 cm long x 1,4 cm across when fully opened, whitish-pubescent before and after anthesis. Rachis finally elongate, reaching 1,5 to 2 cm, the woody axis to 0,8 mm in diameter near the middle, yellowish, slightly zigzag, lanate by a soft to fluffy white-woolly tomentum of fine irregularly septate crispy hairs 0,8-1,5 mm long, extremely interwoven for the most part, continued to the 0,4-0,5 mm long pedicels (these jointed above the bracteoles) and concealing basal part of flowers. The bisexual flowers pentamerous (Fig. 2 A), from c. 10 to over 50 per spike, conspicuous by brilliant violet-rose to purplish tepal ends in flowering stages. Subtending bract and bracteoles inconspicuous but well-developed, membranous, translucent-shining, concave, the midrib more or less excurrent, about half as long as the perianth at maturity, entirely glabrous, rather persistent on the woolly rachis after the perianthfalls, unequal in shape. Bract (Fig. 2 B) narrowly ovate to ovate-lanceolate, acuminate with a top c. 0,2 mm long, becoming 2,2-3,0 mm, up to 1,4 mm broad below the middle, the light to dark brown midrib forming an obvious keel, the margins finely serrulate towards or near apex. The two bracteoles (Fig. 2 C) papery and colourless, roundish obovate to subcordate-orbicular, becoming 2,8-3,5 mm long by (2,3-) 2,5-2,8 mm broad at or above the middle, the midrib weak, scarcely cuspidate with a

minute point, evidently serrulate to dentate in about the upper third of margins, completely embracing the perianth in its lowest part. Perianth scarcely exceeding 6 mm long, at first stiffly erect, later campanulately divergent to 2-4 mm across in upper scarious portion, copiously plumose externally, thickened and indurate towards a rounded base of 0,8-1,2 mm diameter, formed by the constricted lowermost parts of tepals; base concave beneath due to sunken attachment of the pedicel, the notch densely surrounded by a ring of bristle-like nodulose hairlets 0,4-0,8 mm long. Tepals (Fig. 2 A) usually subequal, evidently bicolorous when flourishing, dull-purplish turning greenish, exhibiting a coriaceous dorsally pilose central areole, this tapering distally, bordered by membranous glabrous purple to violet-rose (later pale pinkish to stramineous), entire margins gradually dilated and fused apically at the lustrous tip; all perianth-segments three-ribbed in about lower half to two-thirds, the prominent midvein continued to summit, the lateral nerves edging the opaque centre and convergent distally. Tepals free down to an open disk-like base, not bipartite (clawed), their dorsal white heterogeneous vestiture scarcely masking tepal colours. Hairs on tepals knotted (several-celled) straight comparatively thin, of two distinct kinds, unequal in length and structure: (a) feathery erecto-patent trichomes in about the distal halves to two-thirds of tepal minutely spinulose-articulate, (1,8-) 2,5-3,2 mm long and never exceeding the apex, in proximal part of tepals intermingled with or giving way to (b) much shorter, indistinctly and remotely nodulose hairlets about 0,4-1,0 mm long, more or less evanescent with age and ultimately leaving a convex subglabrous spot near base; the scarious marginal zones vanishing basally, enlarging upwards and fusing into the apical glabrous portion attaining 2 mm long in the two outer perianth-segments. These rather uniformely linear, becoming up to 6,2 mm long and c. 1 mm wide at or below middle, hardly contracted (sometimes even widened) to a truncate irregularly erose-denticulate apex, reminiscent in this respect of *Ptilotus symonii* (Benl 1968, Fig. 1 b) or of *P. barkeri* (Benl 1989, Fig. 1 D); inner faces completely glabrous. The three inner tepals linear-subulate, their length and breadth averaging in the ratio 1 to 0,1 (-0,13), distinctly narrowed to an acute or subacute slightly toothed and sometimes inwardly curved tip; two or mostly three segments beset inside with strongly beard-like wool covering the lower region, the crisped hairs copiously borne marginally on one or both sides, thickish, weakly and irregularly septate, averaging 1,2 mm long, surrounding androecium and gynoecium. Distinct internal pubescence occasionally produced in two tepals only, then the outermost segment shaped much like an outer tepal, thus displaying a more or less intermediate character. Androecium and gynoecium (Fig. 2 D) markedly shorter than the perianth. The consistently pentamerous androecium with equally perfect stamens in all flowers examined; filaments upright, diaphanous and flattened, (1,8-) 2,0-2,3 (-2,5) mm long, to c. 0,08 mm broad near middle, somewhat tapering at top, gradually widening downwards to c. 0,2 mm and connate with broad sinuses into a short (c. 0,25 mm) staminal cupule without a free ring or nearly so, adherent to the perianth-base; intervening scale-like teeth or lobes (pseudostaminodes) absent; anthers ellipsoidal, about 0,45 x 0,22 mm, pale yellow in fertile stamens. Gynoecium entirely hairless; ovary obovoid to subclavate, almost sessile when fully developed, 0,8-1,5 mm long and up to 0,8 mm in largest diameter; style undivided, obviously eccentric, straight, 1,5-2,0 mm long on mature ovary, thickened at base to 0,2 mm, persistent; stigma more or less level with the anthers, capitellate-papillose, rather inconspicuous when dried.

Distribution:

Up to the present known only from the type collection with limited range in the Warrego Region (South-west Queensland) where, following the collector's label, it was found growing in a large population ("frequent") 40 km south of Cunnamulla, forming mats in Eucalyptus woodland on sandy loam ground.

The newly established species - observed in a very restricted site - should be regarded as endemic, "Rare" and coded "1RQ38" according to BRIGGS & LEIGH, 1988, unless material from beyond the type area should become available.

Etymology:

Named from the Latin *humifusus*, referring to the habit spread out over the ground.

Affinity:

The present taxon shows resemblance to the endemic *Ptilotus procumbens* (BENL 1983, Fig. 1) from Western Australia as regards the mat-forming habit; however, there is a considerable number of well pronounced differences primarily with respect to floral features, justifying specific rank for our novelty. In *P. procumbens*, bract and bracteoles are ovate-lanceolate, brownish and pilose, in contrast to *P. humifusus* where the bracteoles are roundish and all floral bracts are almost uncoloured and completely lacking indumentum. The tepals of *P. procumbens* bear recurved appendage-like apices, and merely four stamens are consistently functional, whereas in *P. humifusus* the perianth-segments have straight tips, and five stamens are fertile. *P. procumbens* is noteworthy for its short free filaments (0,6 mm) united to an unusually elongated staminal tube (1,3 mm), its stalked ovary being much longer than the sub-central style (s. BENL 1983, Fig. 2 H); in *P. humifusus* 2,3 mm long filaments are fused to a very low (0,25 mm) staminal cupule, and the sessile ovary has a long eccentrical style.

From the material seen (comprising specimens measuring between c. 15 and 40 cm across) *Ptilotus humifusus* would appear to be very constant in its features and in its distinctive appearance not comparable with any previously described species within the genus, except *P. procumbens* with which a closer relationship is clearly evident.

P. humifusus has to be inserted in Group VII (Annual herbs usually prostrate to ascending) of our forthcoming record in vol. 5 of "Flora of Australia".

Acknowledgements

I am much indebted to Dr. C. DENNIS ADAMS, London, for looking through the manuscript and suggesting valuable improvements. Grateful thanks are due to Mr. A. BÖHM and Mr. K. LIEDL for preparing the illustrations.

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- 1983: Taxonomic studies on *Ptilotus* R. Br. (Amaranthaceae) in Western Australia. - Nuytsia (Perth) 4: 263-274.
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BRIGGS, J. D. & J. H. LEIGH, 1988: Rare or Threatened Australian Plants. - Special Publication No. 14, Australian National Parks and Wildlife Service, Canberra, pp. 277.

Adress of the author: Dr. G. BENL, Botanische Staatssammlung München, Menzingerstraße 67, D-80638 München

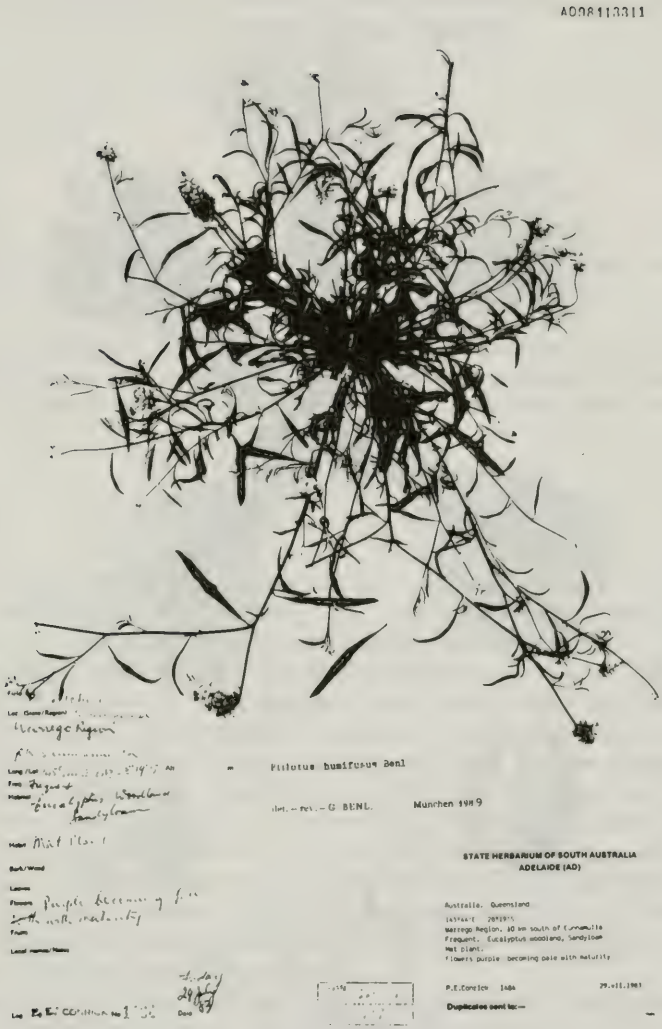

Figure 1. *Ptilotus humifusus* Benl. Holotype sheet, AD 98413311. (Photograph K. LIEDL).

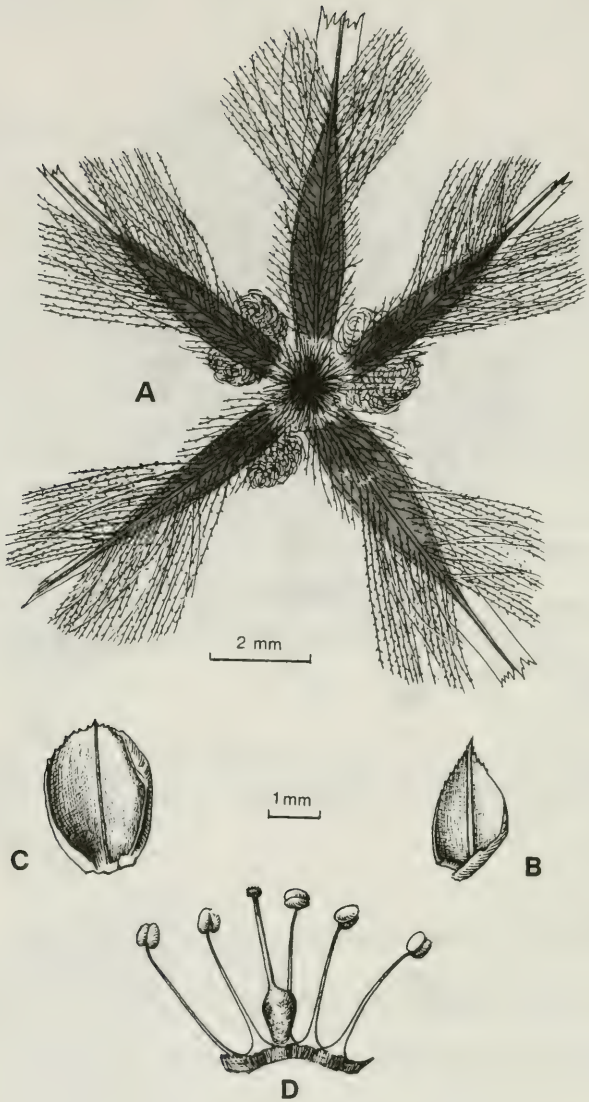

Figure 2. *Ptilotus humifusus* Benl. -- A: Perianth spread open, outer view. B: Bract, inner face. C: Bracteole, inner face. D: Androecium and Gynoecium. (Drawn from holotype by A. BÖHM).

Revision von Astragalus L. Sektion Eremophysa Bunge und Eremophysopsis Gontsch. (Leguminosae)

von

D. PODLECH

Abstract:
PODLECH, D.: Revision von Astragalus L. Sektion Eremophysa Bunge und Eremophysopsis Gontsch. (Leguminosae). - Sendtnera 1: 45-64. 1993. ISSN 0944-0178.

A revision of Astragalus L. sect. Eremophysa Bunge (13 species) and Eremophysopsis Gontsch. (1 species) is given. Descriptions and a determination key are provided, the investigated material is cited. All taxa are typified. All species are growing in desertic and mostly sandy habitats.

Einleitung

Die beiden hier behandelten Sektionen gehören zusammen mit den artenreichen Sektionen *Astragalus*, *Alopecuroidei* DC., *Caprini* DC., *Aegacantha* Bunge und einigen kleinerer Sektionen zu einer zentralen Gruppe basifix behaarter *Astragali*. Hier bildet die Sekt. *Astragalus* mit aufrechtem Wuchs, ± gleichmäßig beblätterten Stengeln, teilweise noch vom Blattstiel freien Nebenblättern, den zahlreichen, meist relativ vielblütigen, sitzenden Trauben und den wenig fixierten, formenreichen Früchten eine relativ ursprüngliche, basale Gruppe. Von hier führen verschiedene Evolutionsrichtungen zu den anderen genannten Sektionen. Starke bis z. T. vollständige Verkürzung der Stengel, Reduktion der Blütenzahl der Teilinfloreszenzen und Ausbildung eines meist deutlichen Infloreszenzstieles führen zur Sekt. *Caprini* DC. Die Sekt. *Alopecuroidei* DC. entsteht durch die Bildung sehr dichter, meist deutlich gestielter Teilinfloreszenzen sowie durch die Fixierung der Fruchtform auf kleine, den Kelch kaum überragende Früchte. Die Sekt. *Aegacantha* wiederum stellt eine Ableitung zu dornig-strauchigem Wuchs dar, deren Arten paarig gefiederte Blätter besitzen, die während der Onotogenie kein Endblättchen mehr ausbilden.

Die beiden hier behandelten Sektionen stellen innerhalb dieser Gruppe eine Ableitung mit blasig aufgetriebenen Fruchtkelchen dar, die auch in verschiedenen anderen Gruppen der altweltlichen *Astragali* zu finden ist.

Astragalus L. sect. **Eremophysa** Bunge in Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 62. 1868. **Lectotypus:** *A. kahiricus* DC. (PODLECH 1990).

Pflanzen ausdauernd, nur mit weißen, meist weichen, basifixen Haaren besetzt, selten fast kahl (*A. litwinowii*). Stengel wohl entwickelt, aufrecht, nur bei *A. kahiricus* zur Blütezeit sehr

kurz, sich später aber stark verlängernd. Nebenblätter mit schmalem oder breitem und dann oft fast stengelumfassendem Grund angeheftet, dem Blattstiel am Grunde kurz angeheftet oder frei. Blätter unpaarig gefiedert mit meist entfernt stehenden rundlichen Blättchen. Blütenstände (Trauben) gestielt bis fast sitzend, meist vielblütig, sich zur Fruchtzeit meist ± deutlich verlängernd. Brakteolen fast immer entwickelt, nur bei *A. tatjanae* fehlend. Blüten kurz gestielt bis fast sitzend. Kelch zur Blütezeit röhrig bis schwach bauchig, seine Zähne auf der Innenseite oft dicht behaart. Fruchtkelch ± stark verlängert, eiförmig bis kugelig blasig aufgetrieben, sehr dünnwandig und deutlich netzartig geadert. Krone meist gelb, kahl, bleibend, im Fruchtkelch eingeschlossen. Frucht im Fruchtkelch eingeschlossen, deutlich gestielt, elliptisch bis eiförmig, klein, an der Bauchseite gekielt, am Rücken gefurcht, vorne kurz geschnäbelt, mit dünnen oder zähen Klappen, fast bis vollständig zweifächerig, wenigsamig.

Schlüssel der Arten

1 Fahne 22-40 mm lang 2
- Fahne 12-21 mm lang 7
2 Schiffchenplatte gerade vorgestreckt, schmallänglich 3
- Schiffchenplatte schiefelliptisch mit bucklig gebogener Unterkante 4
3 Blättchen in 4-9 Paaren, 10-32 mm lang, unterseits dicht behaart; Fahne 26-32 mm lang, Fruchtkelch 18-30 mm lang *4. A. kahiricus*
- Blättchen in 3-6 Paaren, (30-) 50-80 (-90) mm lang; Fahne 30-40 mm lang; Fruchtkelch 28-40 mm lang *12. A. tatjanae*
4 Stengel und Blätter kahl oder nahezu kahl; Blättchen eiförmig, vorne spitzlich bis spitz *8. A. litwinowii*
- Stengel und Blätter deutlich behaart 5
5 Blättchen elliptisch bis breiteiförmig, 20-40 (-50) mm lang; Kelchzähne 1/5-1/4 der Röhrenlänge erreichend; Fruchtknoten und Frucht behaart *9. A. maximowiczii*
- Blättchen rundlich, 8-25 mm lang; Kelchzähne mindestens 1/3 der Röhrenlänge errreichend; Fruchtknoten und Frucht kahl 6
6 Blättchen in 4-5 Paaren; Blütenstand 3-7 blütig; Kelchzähne 1/3-2/5 der Röhrenlänge erreichend, auf der Innenseite dicht behaart *3. A. jarmalii*
- Blättchen in 7-8 Paaren; Blütenstand vielblütig; Kelchzähne 3/4-4/5 der Röhrenlänge erreichend, auf der Innenseite kahl oder anliegend behaart *10. A. rassulovae*
7 Fruchtknoten und Frucht behaart 8
- Fruchtknoten und Frucht kahl 9
8 Fruchtknoten und Frucht dicht behaart; Blattstiel kaum entwickelt, höchstens bis 2 cm lang; Blättchen (10-) 15-25 (-30) mm lang *6. A. lehmannianus*
- Fruchtknoten und Frucht spärlich behaart; Blattstiel 2-4 cm lang; Blättchen 5-11 mm lang *5. A. kelifii*
9 Blütentrauben locker- bis sehr lockerblütig, 9-20 (-25) cm lang; Kelche dicht behaart 10
- Blütentrauben dichtblütig, bis 8 (-9) cm lang; Kelche spärlich bis locker, zuweilen nur an den Zähnen behaart 11
10 Blättchen in 12-18 Paaren, 5-10 mm lang; Blütenstände sitzend oder höchstens bis 2,5 cm lang gestielt; Blütentraube 9-13 cm lang; Fahne 16-18 mm lang *13. A. winkleri*
- Blättchen in 4-7 Paaren, 10-25 mm lang; Blütenstände mit einem 3-5 cm langen Stiel; Blütentraube 15-25 cm lang; Fahne 12-15 mm lang *1. A. chivensis*
11 Blättchen in (6-) 7-10 Paaren, 10-21 mm lang *7. A. leiophysa*

- Blättchen in 3-5 Paaren, 20-25 (-30) mm lang 12
12 Kelch 12-14 mm lang, seine Zähne ca. 1/2 der Röhrenlänge erreichend; Fruchtkelch 15-20 mm lang; Hülse 3-4 mm lang gestielt *11. A. sphaerophysa*
- Kelch 10-12 mm lang, seine Zähne 2/3 der Röhrenlänge erreichend; Fruchtkelch 15-16 mm lang; Hülse ca. 2 mm lang gestielt *2. A. citoinflatus*

Aufzählung der Arten

1. **Astragalus chiwensis** Bunge in Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 3: 247. 1880. **Syntypen:** Khiwe zwischen Karak-aty und Adam-kyr-ulgan sowie bei Tschinak-tschika, *Krause, Korolkov* (non vidi)

= *A. registanicus* Rech.f. in Österr. Akad. Wiss., math.- naturw. Kl., Anz. 1968: 178. 1968. **Holotypus:** SE-Afghanistan, in arenosis mobilibus deserti Registan, 25-30 km S Kandahar, 1000 m, 27.5.1968, *Rechinger 35343* (W!; Iso: B!, M!).

Abb.: Fl. USSR 12: 405, tab. 27, fig. 1. 1946. Fl. Turkmenii 4: 234, tab. 47, fig. 1. 1949. Fl. Kazakhstana 5: 183, tab. 25, fig. 3. 1961. Fl. Tadzhikskoi SSR 6: 233, tab. 37, fig. 3-4. 1981.

Pflanzen ausdauernd, mit 0,5-1,5 mm langen, dünnen, weißen Haaren bedeckt. Stengel 25-50 (- 70) cm hoch, aufrecht, am Grunde bis 8 mm dick, kantig gefurcht, ± dicht beblättert, am Grunde oder auch höher hinauf dicht fast anliegend behaart, oft rasch verkahlend, zuweilen im oberen Teil nur locker mit ± abstehenden Haaren bedeckt. Nebenblätter grünlich, schmaldreieckig, die der unteren Blätter bis 10 mm lang, die der oberen Blätter kürzer, gewimpert, kaum mit dem Blattstiel verbunden, rasch hinfällig. Blätter 8-20 cm lang; Blattstiel 2-4 (-6) cm lang, wie die Rhachis hellstrohfarben, etwas starr oder schwach verhärtend, locker abstehend behaart. Blättchen in 4-7 Paaren, entfernt stehend, (7-) 10-25 (-28) mm lang und fast ebenso breit, fast kreisförmig, oberseits kahl oder vor allem gegen den Rand zu locker, unterseits dicht wirr fast anliegend seidig behaart, oft nach oben zusammengefaltet. Blütenstände mit einem 3-5 cm langen, starren, locker abstehend behaarten, oft verkahlenden Stiel, sehr locker vielblütig; Traube (10-) 15-20 (-25) cm lang. Brakteen grünlich, linealisch, zugespitzt, 4-8 mm lang, gewimpert. Blütenstiele 1-2 mm lang, spärlich behaart. Brakteolen grünlich, linealisch, spitz, 3-4 mm lang, gewimpert, am Grunde des Kelches ansitzend. Kelch zur Blütezeit (8-) 10-13 mm lang, röhrig bis schwach bauchig, bleichgrün, dicht wirr abstehend behaart; Zähne schmaldreieckig, 5-6 mm lang, etwas kürzer als die Röhre, auf der Innenseite ± dicht anliegend behaart. Fruchtkelch schwach vergrößert, 14-20 mm lang, schmaleiförmig aufgeblasen, dünnhäutig, hell grünlichbraun bis hellrotbraun, fein netzig geadert. Krone gelblich oder hellgrünlichgelb. Fahne (12-) 14-15 mm lang; Platte (5-) 7-9 mm breit, ± kreisrund oder etwas breiter als lang, vorne schwach eingeschnitten, am Grunde plötzlich in den langen Nagel zusammengezogen, meist über dem Nagel etwas zrückgebogen. Flügel etwa so lang wie die Fahne; Platte länglich, vorne breit gerundet, ca. 6 mm lang und 3 mm breit; Öhrchen kaum 1 mm lang, Nagel ca. 8 mm lang. Schiffchen 11-13 mm lang; Platte schiefdreieckig, mit breit gebogener Unterkante und fast gerader Oberkante, vorne stumpflich, ca. 5,5 mm lang und 3,5 mm tief; Öhrchen kurz, Nagel ca. 8 mm lang. Staubfadenröhre ± gerade abgeschnitten. Fruchtknoten 2-4 mm lang gestielt, kahl, mit ca. 6 Samenanlagen; Griffel dünn, lang. Frucht mit einem dünnen 2-4 mm langen Stiel, 6-8 mm lang, ca. 2,5 mm hoch und 4 mm breit, an der Bauchseite breit gerundet mit hervortretendem Nerv, am Rücken schwach aber breit gefurcht,

vorne mit einem kurzen Spitzchen; Klappen dünn, zäh, kahl, bräunlich, fein queraderig. Hülse sich an Bauchseite und später auch am Rücken öffnend, vollständig zweifächerig, meist zweisamig. Samen länglich, ca. 4,5 mm lang und 2 mm breit, olivgrün mit undeutlichen dunklen Flecken und Punkten, matt.
Blütezeit: IV-VI. **Vorkommen:** auf beweglichen Sanden.
Verbreitung: Iran, Afghanistan, Turkmenistan, Uzbekistan, Tadzhikistan.

Gesehene Belege:

Turkmenistan. Prov. Krasnovodsk: Stat. Mulla Kara, near Stat. Dzhebil, 4.4.1895, *Korshinsky 1163* (LE) zwischen Stat. Ajdin und Pereval, 1959, *Ischtschenko* (MA, W). -- Prov. Tschauz: Ebene Sary-Kamysch (mittlerer Teil), 8.5.1953, *Rodin & al. 178* (LE) - Prov. Ashkhabad: Zentr. Kara-kum, near Biol. Stat. near well "Kary-kul", 5.4.1964, *Botschantzev & al. 470* (LE) - Zentr. Kara-kum, 25 km N Schoutly, am Weg nach Kurtysch-baba, 19.5.1952, *Rodin & al. 1995* (LE) - prope Aschabad, 9.5.1898, *Litwinow 1290* (LE, W) - Gjaurs, 3.5.1889, *Antonov* (LE) - zwischen Annau und Gjaurs, 18.5.1900, *Sintenis 340* (BM, LD, LE, P, W) - dto., 14.5.1911, *Michelson 178* (LE) - Oase Tedzhen, VII.1916, *Bukinitsch* (LE). -- Prov. Mary: Merv, 22.-5.1895, *Korshinsky 1128* (LE). -- Prov. Tschardzhou: ad fl. Amu-darja pr. Farab, 26.5.1903, *Androssov* in Herb. Fl. Ross. *1411* (B, LE) dto., 23.4.1910, *Michelson,* Hort. Imp. Petrop. *38* (LE, M, Hb. PODL.) - dto., 10.5.1902, *Androssov* in Herb. Fl. SSSR 3715 (BM, LE, W) - dto., 4.5.1913, *Stakhanov 323* (LE) - zwischen Farab und Olynom, 5.5.1884, *Regel* (LE) - near Tschardzhu, 28.4.1912, *Sendmuradov* (LE)- zwischen Tschardzhu und Brunnen "Salim", 9.5.1884, *Regel* (LE) - pr. Repetek, 5.5.1897, *Litwinow 202* (LE) - dto., 10.5.1925, *Basilievskaja & al.* (LE) - inter Ischakrabat et Repetek, V.1884, *Regel* (LE) - Stat. Karayl-Kuju, 6.5.1911, *Michelson 118* (LE) - Kelifskij Uzboj (Karakum), NW des Brunnen "Matschiki", 19.4.1925, *Dubiansky 128* (LE) - SW' Karakum, Kerki-daga, 16.5.1934, *Popov* (LE) - Region Kerki, St. Burgutschi, 2.5.1928, *Budyr* (LE). -- Nicht genau lokalisierbar: Kara-kum, beim Brunnen "Bisch-kak", 25.4.1925, *Dubiansky 239* (LE) - beim Brunnen "Geldybai", 27.4.1929, *Makeev* (LE) - zwischen Dash-adzhi und Mirza-tschasch, 26.4.1912, *Sawicz-Ryczgorski* (LE) - 12 km SW vill. Jevbasar, 18.6.1932, (Pojarkova (LE) - SW' Kara-kum, Brunnen "Doe-Adzhi", 23.4.1932, *Morozov* (LE) - Kara-kum, Sande beim Vorposten Schakh-Senem, 13.5.1953, *Rodin & al. 240* (LE) - Stat. Utsch-Adzhi, 18.5.1889, *Antonov* (LE).

Uzbekistan. Karakalpak: Delta Amu-Darja, Sande bei Kaschkala-tau, 12.6.1953, *Rodin & al. 669* (LE) - Delta Amu-Darja, Hügel "Kyzyl Dzhar", 1.6.1953, *Rodin & al. 475* (LE) - Delta Amu-Darja, Sovchos "Madanijat", 4.6.1980, *Artemenko* (LE) - zwischen Batkak und Mumakh nahe Nukus, 1.5.1913, *Popov 105* (LE) - zwischen Nukus und Bisch-tjube, 1.5.1913, *Popov* (LE) - SE Stat. Bisch-tjube, 9.5.1915, *Krascheninnikov 148* (BM, LE) - SW' Kyzyl-kum, 30 km SE Myblik, 14.5.1932, *Rusanov 428* (LE) - SW' Kyzyl-kum, S Kali-agatsch, 30.6.1928, *Rusanov 262* (LE) - SW' Kyzyl-kum, beim Brunnen "Alan-tai", 26.5.1932, *Poretzkij* (LE) - SW' Kyzyl-kum, N' Teil der Sande "Dzhaman-Kumov" beim Brunnen "Saksaul", 15.6.1932, *Nikitin 219* (LE) - road from Tjulas-Kazgana to Tajdzhan-Kazgan, 20.5.1932, *Portezkij* (LE) - zwischen Djunguluk-kak und Buguty, 25.5.1932, *Poretzkij* (LE) - Sultan-Tschizdag, 5.4.1913, *Popov 95* (LE) - near Petro-Alexandrovskaja [= Turtkul], 6.5.1914, *Zaregradskij* (LE) - on road 20 werst E Mamardyna, 8.5.1914, *Smirnow 64* (LE). -- Prov. Buchara: from Assija to Farab, 3.5.1913, *Stakhanov 297* (LE) - Sande "Sindukli" am Amu-Darja, S'Ufer des Dengiz-Kul, 10.5.1911, *Golbek* (LE) - Kyzyl-kum zwischen den Brunnen "Medami" und "Duval", 31.5.1948, *Rodin & Arkaden 212* (LE). -- Nicht genau lokalisierbar: Bass. riv. Amu-Darja, loco Katsch-guzar, 19.4.1939, *Nikitin 54* (LE) - Kyrkuju, 14.5.1916, *Korovin 715* (LE).

Tadzhikistan. Vakhschsk. Dolina, W'Hänge Gory Kara-dum, 6.5.1937, *Nikitin 537* (LE).

Iran. Prov. Semnan: Touran protected area, 2,5 km N Darbh Ahang at old road to Rezaabad, 910 m, 13.5.1978, *Freitag 15324* (Hb. FREITAG). -- Prov. Khorasan: 40 km E Bojnurd an der Straße nach Meshed, 5.6.1976, *Manutsheri 580* (Hb. PODL.) - 56-60 km N Gonabad inter Mahneh et Emrani, 900 m, 9.5.1975, *Rechinger 51397* (W) - N Gonabad (Juymand), 30.5.1977, *Rechinger 56014* (B, M, W) - 36 km S Gonabad, 7.6.1977, *Soják 7682, 7683* (PR) - 50 km SE Ferdow, 1100 m, 10.7.1975, *Iranshahr 40859-E* (W) - 25 km SE Boshruyeh, 900 m, 11.5.1975, *Iranshahr 49860-E* (W) & *Rechinger 51661* (W). -- Prov. Yazd: 6 km SE Robate Khan, 1000 m, 14.5.1975, *Iranshahr 40856-E* (W) & *Rechinger 51800* (W).

Afghanistan. Prov. Balkh: 12 km N Khairabad, ca. 40 km N Mazar-i-Sharif, 16.5.1972, *Uotila 16885* (H). – Prov. Kandahar: Kushke Nakhud an der Straße von Kandahar nach Girishk, 900 m, 28.5.1968, *Toncev* (Hb. PODL.) - in arenosis deserti Registan, 25-30 km S Kandahar, 1000 m, 27.5.1967, *Rechinger 35343* (B, M, W) - 31 km SE Kandahar, désert du sable Sahai Registan, 1075 m, 28.4.1967, *Lalande R.802-S13* (Hb. PODL.) - Dori Rud, ca. 50 km SE Kandahar, 15.4.1958, *Pabot A.488* (W).

2. Astragalus citoinflatus Bond. in Not. Syst, Herb. Bot. Acad. Sci. Uzbek. 16: 4. 1961.
Typus: Peski (Wüste) Mujun-Kum, zwischen dem See Tschingil und Ajak, 28.6.1926, *Drobov & Gomolitzkij 882* (TAK, non vidi).

Pflanzen ausdauernd. **Erdstock** bis 3 cm dick, mit wenig verzweigten, kurzen, bis 1 cm dicken Erdsprossen. **Stengel** einzeln (?), bis 1 cm dick, kantig-gefurcht, 40-60 cm hoch, ziemlich dicht mit weißen, sehr dünnen, weichen, oft gebogenen, 1-1,5 mm langen, abstehenden Haaren besetzt. **Nebenblätter** schmaldreieckig, zugespitzt, ca. 10 mm lang, kahl, am Rande weißgewimpert, am Grunde auf 2-3 mm mit dem Blattstiel verbunden. **Blätter** 10-16 cm lang; Blattstiel und Rhachis spärlich weißhaarig. **Blättchen** in 3-4 (-5) Paaren, 20-25 mm lang, rundlich, oberseits kahl, unterseits weißhaarig. **Blütenstände** sitzend, dicht, 4-7 (-9) cm lang. **Brakteen** schmaldreieckig, spitz, 7-10 mm lang, weißgewimpert. **Brakteolen** linealisch, zugespitzt, 4-5 mm lang, gewimpert. **Kelch** zur Blütezeit 10-12 mm lang, spärlich weißhaarig; Zähne 3,5-4,5 mm lang, 2/3 der Röhrenlänge erreichend, dicht und lang weißgewimpert. **Fruchtkelch** rasch aufgeblasen, 15-16 mm lang, seine Zähne 5,5-6 mm lang. **Krone** cremefarben, Fahne rosa überlaufen. **Fahne** 15-16 (-17) mm lang; Platte ± kreisrund, vorne eingeschnitten, am Grund in den ebenso langen Nagel verschmälert. **Flügel** 16-17 (-18) mm lang; Nagel etwa so lang wie die Platte. **Schiffchen** 14-15 (-16) mm lang. **Fruchtknoten** kahl. **Frucht** ca. 2 mm lang gestielt, oval-länglich, 5-7 mm lang, mit einem ca. 2 mm langen Schnabel, kahl. **Samen:** ca. 2 mm lang.
Blütezeit: V-VI. . **Vorkommen:** In Sandwüsten.
Verbreitung: Kazakhstan: Wüste Mujun-kum.

Gesehene Belege:

Kazakhstan. Prov. Dzhambul: 4 km N Stat. Akyr-tjube, E Dzhambul, 3.6.1931, *Igolkin 49* (LE) - reg. Mujun-kum, nahe Aulieata [= Dzhambul], 5 werst SE des See Kargaly Kul, 19.5.1910, *Golbek* (LE) - Aulieatinsk. reg., Mujun-kum, bei Karoj, 26.6.1909, *Minkwitz 799*(LE) - Mujun-kum, See Dzhideli, 8.9.1930, *Butrjakov 638* (LE) - Mujun-kum, Brunnen "Kujandy", 24.5.1926, *Drobov & Gomolitzki 129* (LE) - reg. Dzharkent. Mujun kume, ca. 80°00' E, 44°00' N, 6.7.1930, *Matveeva & Rodin 12* (LE) - Straße von Tekeja nach Dzhimgin-Uzjak, 26.5.1905, *Abramov* (LE).

3. Astragalus jarmalii Podlech, spec. nov.
Holotypus: Afghanistan, Prov. Herat, 44 km W Herat an der Straße nach Eslam Qala, 830 m, 27.4.1977, *Podlech & Jarmal 29337* (Hb. PODLECH!).

Plantae ad 20 cm altae, perennes, albipilosae. Caules dense pilis ad 1 mm longis patentibus obtecti. Stipulae virides, 6-11 mm longae, subliberae, margine ciliatae. Folia 12-20 cm longa, 4-5 juga, petiolo 3-7 cm longo, sicut rachis dense patenter piloso. Foliola remota, 10-25 mm longa et 8-22 mm lata, orbicularia vel late obovata, antice late rotundata, supra glabra, subtus

dense vel densissime breviter subappresse pilosa, margine dense pilosa. Racemi in axillis foliorum superiorum subsessiles, laxe 3-7 flori. Bracteae viridiusculae, lineares, 5-7 mm longae, pilosae. Pedicelli 2-3 mm longi, pilosi. Bracteolae 2-3 mm longae. Calyx tempore florendi 15-18 mm longus, tubulosus vel leviter ventricosus, densissime breviter villosus, dentibus 4-5 mm longis, intus appresse pilosis; calyx tempore fructificationis inflati-ovatus, 20-25 mm longus et 7-8 mm diametro. Corolla flava. Vexillum 27-30 mm longum, lamina elliptica. Alae 26-30 mm longae, lamina anguste oblonga, apice rotundata, auricula 1-1,5 mm longa provisa. Carina 25-27 mm longa, lamina oblique elliptici-curvata. Ovarium stipite 2-3 mm longo suffultum, glabrum. Fructus stipite ca. 4 mm longo suffultus, ellipticus, ca. 10 mm longus, ventro carinatus, dorso profunde sulcatus, glaber, fere complete bilocularis, in calyce inclusus.

Pflanzen bis 20 cm hoch, ausdauernd, weißhaarig. Erdstock dick, ein- bis mehrköpfig, zuweilen kurze Erdsprosse bildend. Stengel bis 13 cm hoch, dicht bis sehr dicht mit 0,3-1 mm langen abstehenden Haaren bedeckt. Nebenblätter grün, aus breitem, den Stengel teilweise umfassenden Grund eiförmig bis dreieckig verschmälert, spitz, frei oder am Grunde sehr kurz mit dem Blattstiel verbunden, am Rande gewimpert, 6-11 mm lang, an den oberen Blättern häufig kürzer. Blätter, zumindest die unteren, fast waagerecht abstehend, 12-20 cm lang; Blattstiel 3-7 cm lang, wie die Rhachis dicht kurz abstehend behaart. Blättchen in 4-5 (-6) Paaren, entfernt stehend, 10-25 mm lang und 8-22 mm breit, rundlich bis breit verkehrt-eiförmig, zuweilen breiter als lang, vorne breit gerundet, ober-seits kahl, unterseits und am Rande dicht bis sehr dicht mit kurzen, weichen, fast anliegenden Haaren bedeckt. Blütenstände in den Achseln der oberen Blätter fast sitzend, locker (1-) 3-7 blütig, mit dicht abstehend behaarter Traubenachse. Brakteen grünlich, linealisch, 5-7 mm lang, behaart. Blütenstiele 2-3 mm lang, abstehend behaart. Brakteolen linealisch, 2-3 mm lang, unterhalb des Kelches angeheftet. Blütenkelch 15-18 mm lang, röhrig bis schwach bauchig, sehr kurz dicht abstehend behaart; Zähne schmaldreieckig, 4-5 mm lang, auf der Innenseite dicht anliegend behaart; Fruchtkelch eiförmig-aufgeblasen, 20-25 mm lang und 7-8 mm dick. Krone gelb. Fahne 27-30 mm lang; Platte elliptisch bis rhombisch-eiförmig, 10-13 mm breit, vorne eingeschnitten, am Grunde keilig in den Nagel verschmälert. Flügel 26-30 mm lang; Platte schmallänglich, oft schwach gebogen, vorne gerundet, 13-15 mm lang und 3,5-5 mm breit; Öhrchen sehr breit, 1-1,5 mm lang, Nagel 13-15 mm lang. Schiffchen 25-27 mm lang; Platte schiefelliptisch-gebogen, mit breit gebogener Unterkante und schwach konkaver Oberkante, vorne breit gerundet, 12-13 mm lang und 5-6 mm tief; Öhrchen breit, ca. 1 mm lang, Nagel 13-14 mm lang. Staubfadenröhre ± gerade abgeschnitten. Fruchtknoten 2-3 mm lang gestielt, kahl. Frucht im Kelch eingeschlossen bleibend, ca. 4 mm lang gestielt, elliptisch, ca. 10 mm lang, 6 mm hoch und 4 mm breit, an der Bauchseite gekielt, am Rücken tief gefurcht, vorne in den bleibenden Griffel auslaufend, kahl, fast vollständig zweifächerig.
Blütezeit: IV. **Vorkommen:** In Steppen.
Verbreitung: NW-Afghanistan, Iran (Khorasan).

Gesehene Belege:

Iran. Prov. Khorasan: Badghiz, inter Tayyebat (34°44' N - 60°45' E, et Kisil Islam Qaleh, 34°40' N - 61°05' E, 700 m, 21.4.1967, *Rechinger 33256* (G, W) - Torbate-jam, Mashhad road, 1150 m, 24.5.1972, *Foroughi 8922* (G) - Sser-Tshah, III.1859, *Bunge* (W) - Tabas, Derenjal bei Deh Mahmad, 28.4.1964, *Ruttner 521* (W).

Afghanistan. Prov. Herat: 44 km W Herat an der Straße nach Eslam Qala, 830 m, 27.4.1977, *Podlech & Jarmal 29337* (Hb. Podl.) - Herat, 9oo m, 22.4.1949, *Köie 3734* (W) - Harirud valley, 9.5.ü1885, *Aitchison 236* (P).

4. Astragalus kahiricus DC., Prodr. 2: 292. 1825 ≡ *A. longiflorus* Del., Descr. Egypte, Hist. Nat.: 256. 1814, nom. illeg. non Pallas 1802 ≡ *A. aegyptiacus* Sprengel, Syst. Veg. ed. 16, 3: 298. 1826, nom. illeg. non Miller ≡ *Tragacantha kahirica* (DC.)Kuntze, Revis. Gen.: 945. 1891. **Typus:** sur le chemin du Kaire à Souyes, dans la vallée de l'Égarément, leg. *Lloyd* in Hb. Delile (MPU! sub nomine *A. longiflorus*).

= *A. isopetalus* Boiss., Diagn. Pl. Orient. 9: 67. 1849. **Holotypus:** in regno Cabulico, *Griffith* in herb. HOOKER no. *1067* (K!)

= *A. subkahiricus* Gontsch. in Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 9: 132. 1946. **Typus:** Montes Pamiro-Alaj austro-occidentales, inter Kelif et pag. Okuzbulak, 13.5.1916, *M.Popov* (TAK, non vidi).

Abb.: DELILE: Descr. Egypte, Hist. Nat.: pl. 39. 1814 (sub *A. longifloro*). ZOHARY, M.: Fl. Palestina 2: pl. 114. 1972.

Pflanzen ausdauernd, bis 65 cm hoch, mit weichen, weißen Haaren besetzt. Erdstock kräftig, bis 3 cm dick, mehrköpfig, verzweigt. Stengel einzeln oder zu mehreren, zur Blütezeit oft kurz bis fast fehlend, sich später stark verlängernd und bis 50 cm lang, kräftig, kantig gefurcht, zuweilen ± stark zickzackartig gebogen, dicht mit 0,5-1 mm langen abstehenden Haaren bedeckt. Nebenblätter grün, 6-9 mm lang, aus breitem, fast stengelumfassendem Grund dreieckig zugespitzt, abstehend behaart, unter sich und vom Blattstiel frei oder am Grunde kurz mit dem Blattstiel verbunden. Blätter 13-25 (-30) cm lang; Blattstiel 2,5-6 cm lang, wie die Rhachis kräftig, fein gerillt, dicht kurz abstehend behaart. Blättchen in 4-8 (-9) Paaren, entfernt stehend, (7-) 10-32 mm lang und breit, nahezu kreisrund oder etwas breiter als lang, vorne sehr breit gerundet bis schwach ausgerandet, am Grunde schwach keilförmig, oberseits kahl, unterseits dicht kurz wirr anliegend bis abstehend behaart. Blütenstände nahezu sitzend, vielblütig, seltener nur 3-5 blütig; Traube 5-10 cm lang, zur Fruchtzeit bis auf 15 cm verlängert, Traubenachse wie der Stengel behaart. Brakteen grün, linealisch, spitz, 8-12 mm lang, dicht behaart. Blütenstiele 2-3 mm lang, behaart. Brakteolen grün, fädlich, 3-5 mm lang, behaart, im oberen Teil der Blütenstiele ansitzend. Kelch zur Blütezeit 14-16 (-20) mm lang, röhrig bis schwach bauchig, sehr dicht zottig mit 1-2 mm langen abstehenden Haaren bedeckt; Zähne schmaldreieckig, (3-) 4-5,5 (-6) mm lang, auf der Innenseite dicht anliegend behaart. Fruchtkelch 18- 30 mm lang, eiförmig bis ellipsoidisch aufgeblasen, fein netzig geadert, locker bis ziemlich dicht abstehend behaart; Zähne 7-8 mm lang. Krone gelb. Fahne 26-32 mm lang; Platte 7-9 mm breit, schmalelliptisch, vorne schwach eingeschnitten, am Grunde allmählich in den halb so langen Nagel verschmälert. Flügel etwa so lang wie die Fahne; Platte schmallänglich, vorne gerundet, 15-18 mm lang und 3-4 mm breit; Öhrchen breit, ca. 1 mm lang, Nagel 11-14 mm lang. Schiffchen 25-31 mm lang; Platte schmalelliptisch, gerade vorgestreckt, vorne gerundet, 12-15 mm lang und 3,5-5 mm tief; Öhrchen breit, ca. 1 mm lang, Nagel 13-15 mm lang. Staubfadenröhre fast gerade abgeschnitten. Fruchtknoten 2-4 mm lang gestielt, kahl; Griffel dünn, lang. Frucht mit einem 3-4 mm langen, seitlich am Grunde ansitzenden Stiel, 8-15 mm lang, 5-6 mm hoch und 4-5 mm breit, an der Bauchseite gekielt, am Rücken tief und breit gefurcht, vorne mit einem dünnen, 2-3 mm langen Schnabel; Klappen dünn, quergeadert, kahl. Hülse sich an der Bauchseite öffnend, fast vollständig zweifächerig, meist zweisamig. Samen elliptisch-nierenförmig, 5,5-6 mm lang und 4-4,5 mm breit, schmutzig rötlichbraun, runzlig, matt.

Blütezeit: III-VI. **Vorkommen:** auf sandigen Steppen- und Wüstenböden.

Verbreitung: Ägypten, Israel, Jordanien, Saudi Arabien, Kuweit, Syrien, Iraq, Iran, Afghanistan, Pakistan, Turkmenistan, Uzbekistan.

Gesehene Belege:

Ägypten: Ramleh, 1877, *Letourneux* (P) - in deserto Kahirino, 1837, *Aucher-Eloy* (G) - env. de Caire, Ouadi Doukla, 2.5.1880, *Cramer* (G) - versteinerter Wald bei Kairo, 12.4.1909, *Keller* (BM, P) - Tel el Kebir, 23.2.1923, *Simpson 1818* (G) - Ramses, *II.1877, Letourneux* (P) - sur le chemin du Kaire à Soueys, dans la vallée de l'Égarément, *Lloyd* (MPU). -- Sinai: desert de l'Isthmus, entre Bir el Abd et Bir el Mosar, 27.3.1891, *Deflers* (MPU) - inter Kahiram et El Arysch, ad Bubastim, 1855, *Kotschy 553* (P, W) - El Arisch, 25.3.1880, *Barbey* (MPU, P) - dto., 25.5.1880, *Barbey 338* (G) - dto., 2.5.1925, *Naftolsky* (HUJ, Hb. PODL.) - dto., 2-3 hours SE, 2.5.1925, *Eig* (G) - dto., Fegirah, 8.5.1887, *Ascherson 971* (P, W) - 10 km E of Bir Gifgafa, 5.3.1968, *Danin & Shmida* (HUJ) - Umm Qataf, 2 km N of Nitssana, 9.4.1976, *Danin* (HUJ) - near Itam Air-field, ca. 12 km SW of Sadot, 80 m, 29.3.1982, *Danin* (HUJ) - S Wadi Charandel, 22.3.1904, *Kneucker 37* (B) - 10 km E Suez, 70 m, 17.1.1971, *Halevy* (HUJ) - 4 km SW of Parker Monument, 8.4.1970, *Danin* (HUJ) - 15 km NW Mitla Pass near Wadi el Haj, 13.5.1975, *Danin* (HUJ) - Mitla Pass, 13.4.1945, *Danin* (HUJ) - E of Wadi Aqaba, 550 m, 9.4.1970, *Halevy S-3711* (HUJ, Hb. PODL.) - Arabia petraea, inter Tih et Nuckl [Nakhl], III.1846, *Boissier* (G) - Plantae Deserti Tih, Ramleh, 15.3.1882, *Post* (G) - in deserto Tih, El Hadid Abiad, 22.3.1884, *Post 151* (BM) - Wadi Berra, 15 km NE Feiran Oasis, 1200 m, 23.5.1969, *Tadmor* (HUJ). -- Nicht genau lokalisierbar: Maddheh el Chushum, 3.5.1887, *Ascherson 973* (P)

Iraq. Lower Jazira District (DLJ): Al Jazira, inter Al-Falluja et Wadi Tharthar, 3.5.1957, *Rechinger 13542* (W). -- Southern Desert District (DSD): 15 km SE Ashuriya, 50 km WNW Shabicha, 360 m, 26.4.1957, *Rechinger 9472* (M, W) - ad confines Saudi-Arabiae in ditione stationis munitae As-Salman, 210 m, 22.4.1957, *Rechinger 9299* (G, M, W).

Syrien: Tell Daba entre Palmyre et T3, 2.4.1955, *Pabot 337* (G) - de Palmyre à Abou Keinal, 4.4.1934, *Gombault 4101* (P, Hb. PODL.).

Israel: Negev, 18 km W Beersheba to Ein Shalala, 27.3.1942, *Zohary* (HUJ) - Revivim, 25.3.1952, *d'Angelis* in Fl. Terrea Isr. exs. *540* (B, BM, G, HUJ, M, MA, P, W) - dto., 6.3.1952, *Feinbrun* (HUJ) - 1 km N Revivim, 1.5.1949, *Jaffe* (HUJ) - 5 km W of Khalisa, Wadi Mna Heiq, 29.3.1942, *Zohary* (HUJ) - Asluj [= Beer Masha'im], 27.3.1945, *Tadmor* (HUJ) - dto., 10.4.1946, *Lupton* (BM) - Khalisa to Asluj, 29.3.1942, *Zohary* (HUJ, M) - env. of Asludj, 17.4.1928, *Zohary* (W) - N of 'Auja el Hafir, 19.2.1947, *Feinbrun* (HUJ).

Jordan: 35 km NE of H-4, 11.4.1974, *Boulos & al. 6961* (G).

Saudi Arabien: - 44 km NW Hail, 21.3.1966, *Hemming 2440* (BM) - Hail, 27.1.1943, *Hardy* (HUJ) - on central track east of Hail, 800 m, 27°25' N - 42°30' E, 28.3.1962, *Zeller 8303* (BM) - Ad Dibdibah, S Hafar al Batin, 350 m, 15.4.1982, *Podzorski 871* (E) - 100 miles W of Ras El Mishaab, lat. 28° N, V.1947, *Schreuder* (HUJ) - (East Prov.) 15 km NW Qaryat al Ulya, 25.2.1966, *Mandaville 537* (BM) - Buraiba, 18.2.1935, *Philby* (BM). -- Nicht genau lokalisierbar: Al Liga, 14.3.1967, *Mosnier 3220* (P, Hb. PODL.)

Uszbekistan. Prov. Surkhan-darinsk. Khr. Kuhitang, zwischen Punkt 1127 und Dorf Aktasch, 10.5.1975, *Botschantzev 57* (LE) - Schirabad reg., Steppe Kyzyryk-dara, 23.4.1915, *Popov* (LE)

Iran. Prov. Tehran: SW Karaj and NW of Shah Dasht, 1200 m, 10.5.1974, *Wendelbo & Foroughi 11275* (W). -- Prov. Semnan: inter Bedescht et Meiomei, 4.6.1858, *Bunge* (P) - inter Maiomai et Abbasabad, 13.6.1948, *Rechinger & al. 5355* (G). -- Prov. Khorasan: N'Rand der Wüste Lut, 1000 m, am Kuh Chah-Ru'i, 15.3.1937, *Gabriel 142* (B) - N du Dasht-e-Lut, entre Deh-salm et Neh, 1050 m, 15.4.1972, *Léonard 5568* (M). -- Prov. Esfahan: Umgebung von Esfahan, 16.6.1967, *Pag 12378-E* (W). -- Prov. Yazd: inter Kerman et Dschupar, 1900 m, *Bornmüller 3721, 3731, 3737* (B) - in desertis ad Seinudin inter Kerman et Yesd, 1900 m, V.1892, *Bornmüller 3732* (B, P) - ca. 40 km NW Anar, 1530 m, 9.5.1961, *Pabot 6995* (G, W) - Oasis de Baidzeh, entre Teheran et Tabas, S du Dasht-e-Kavir, 850 m, 6.4.1972, *Léonard 5414bis* (M, W). -- Prov. Kerman: inter Saidabad (Sirdjan) et jugum Chah Choghuk, 1700-1900 m, 28.4.1948, *Rechinger & al. 3137* (W) - pr. Kerman, IV.1859, *Bunge* (P). -- Prov. Baluchestan: 127 miles N Zahedan, road to Birjand, 2550', 2.4.1971, *Grey-Wilson & Hewer 363* (W) - inter Zahedan et Nosratabad, 39 km W Zahedan, 1250 m, 24.4.1977, *Rechinger 54604* (B, M) - Est du Dasht-e Lut, route de Zahedan à Bam, non loin de Zahedan, 15.4.1972, *Léonard 5593* (M, W) - 34 km W Zahedan, 450 m, 31.3.1964, *Grant 14356* (W) - Saravan, 19.4.1950, *Salavatian 5578-E* (EVIN). -- Nicht genau lokalisierbar: enter Ispahan et Abadeh, 1500-2500 m, 27.4.1956, *Schmid 5415* (M, W).

Afghanistan. Prov. Herat: 30 km E Herat on road to Obeh, 1050 m, 13.5.1969, *Hedge & al. W.7949* (GB). -- Prov. Faryab: west of Salt lake on road from Dawlatabad to Sheberghan, 450 m, 27.5.1969, *Hedge & al. W.8409* (E, GB). -- Prov. Helmand: 142 km SSE Hokumate Darweshan, 1200 m, 14.4.1970, *Lalande R.2449-S2* (Hb.PODL.). -- Prov. Kandahar: 7 km E der Straßengabelung Girishk - Kandahar - Lashkargah, 900 m, 17.4.1978, *Podlech 30734* (Hb. PODL.) - 15 km W Kushke Nakhud, 900 m, 9.3.1969, *Freitag & Breckle 4348* (Hb. BRECKLE, Hb. PODL.) - 19 km SW Shar-e Safa an der Straße nach Kandahar, 1250 m, 15.4.1972, *Anders 8375* (Hb. PODL.) - Dori Rud, 50 km SE Kandahar, 15.4.1952, *Pabot 488* (G) - 2 km NW Spin Boldak, 1200 m, 21.4.1972, *Anders 8708* (Hb. PODL.) - 2 km SE Spin Boldak, 22.4.1972, *Anders 8725* (Hb. PODL.). -- Nicht lokalisierbar: *Griffith* distr. no. *1517* (G-BOIS, M, P, W).

Pakistan. Prov. Quetta: Yaro prope Bostan, 40 km NNE Quetta versus Pishin, 1450 m, 8.5.1965, *Rechinger 28949* (G, W) - Hydozey, Pishin valley, 9.4.1839, *Griffith journ. no. 431* (G-BOIS) - inter Bostan et Khanozai, 1600 m, 10.5.1965, *Lamond 1107* (G) et *Rechinger 29144* (B, G, M, W) - 30,5 miles from Quetta on way to Ziarat, 11.4.1970, *Sultan ul Abedin 4711* (B).

5. Astragalus kelifi Lipsky in Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 158. 1907. **Syntypen:** Kelif, 16.3.1881, *Capus 342* (P!); Baissun, Kokajty, 4.5.1897, *Korshinsky* (LE!). **Lectotypus** (hoc loco designatus): Kelif, 16.3.1881, *Capus 342* (P!).

Pflanzen ausdauernd, bis 50 cm hoch, dicht mit 0,5-1 (-1,2) mm langen weichen, weißen Haaren besetzt. Stengel 20-40 cm lang, aufrecht, kantig gefurcht, dicht mit abstehenden Haaren bedeckt. Nebenblätter weißlichhäutig bis schwach grünlich, 5-7 mm lang, schmaldreieckig, spitz, behaart, am Grunde kurz mit dem Blattstiel verbunden. Blätter 10-20 cm lang; Blattstiel 2-4 cm lang, wie die Rhachis ziemlich dicht wirr abstehend behaart. Blättchen in 6-10 Paaren, entfernt stehend, 5-11 mm lang und breit, fast kreisrund, vorne schwach ausgerandet, oberseits kahl, unterseits und am Rande sehr dicht halbabstehend bis abstehend behaart. Blütenstände sitzend oder die unteren bis 1 cm lang gestielt; Stiel und Traubenachse ± dicht abstehend behaart, Traube (2-) 4-8 cm lang, (5-) 8-14 blütig. Brakteen weißhäutig, linealisch, 4-5 mm lang, behaart. Blütenstiele 0,5-1 mm lang, behaart. Brakteolen linealisch, 3-4 mm lang, behaart, am Grunde des Kelches ansitzend. Kelch zur Blütezeit 12-15 mm lang, röhrig bis schwach bauchig, sehr dicht zottig behaart; Zähne pfriemlich oder aus dreieckigem Grund lang zugespitzt, 3-4 (-5) mm lang, auf der Innenseite dicht anliegend behaart. Fruchtkelch 16-18 mm lang, eiförmig aufgeblasen, dünnhäutig und netzartig geadert, dicht behaart. Krone gelb. Fahne 20-21 mm lang; Platte 7-8 mm breit, elliptisch bis verkehrteiförmig, vorne schwach eingeschnitten, am Grunde eckig in den langen Nagel zusammengezogen. Flügel etwa so lang wie die Fahne; Platte schmallänglich, vorne gerundet, ca. 9 mm lang und 3 mm breit; Öhrchen 0,5-0,6 mm lang, Nagel 12-13 mm lang. Schiffchen 19-20 mm lang; Platte schiefelliptisch gebogen, mit breit gebogener Unterkante und schwach konkaver Oberkante, vorne gerundet, 7-7,5 mm lang und ca. 3,5 mm tief; Öhrchen breit, kurz, Nagel 12-13 mm lang. Staubfadenröhre fast gerade abgeschnitten. Fruchtknoten 2-3 mm lang gestielt, kahl oder schwach behaart; Griffel dünn, lang, kahl. Frucht im Kelch eingeschlossen bleibend, ca. 3 mm lang gestielt, eiförmig bis länglich, ca. 8 mm lang, ca. 4 mm hoch und breit, an der Bauchseite schwach gekielt, am Rücken tief gefurcht, Klappen dünn, fein quergeadert, spärlich abstehend behaart bis verkahlend. Hülse in der Mitte fast vollständig zweifächerig, Septum gegen die Spitze zu schmäler werdend, meist zweisamig.

Blütezeit: III-V. **Vorkommen:** Auf teilweise verfestigten Sanden.

Verbreitung: Turkmesnistan, Uzbekistan.

Gesehene Belege:

Turkmenistan. Prov. Tschardzhouz: Kelif, 13.4.1916, *Popov* (LE) - dto., 16.3.1881, *Capus 342* (P).

Uzbekistan. Prov. Surkhan-Darinsk: Schurabadskaja dolina, vill. Khtaja, 27.4.1912, *Neustruev* (LE) - haud procul ab urbe Termez, 1.5.1928 fl. & 23.5.1927 fr., *Vvedensky* in Hb. Fl. As. Med. *387* (B, G, HUJ, LE, MA, W) - near Termez, river Surkhana, 5.6.1931, *Jarmolenko 1* (LE) - Sande bei Patta-Hissara (bei Termez, 9.4.1912, *Neustruev 208* (LE) - Baissun, Kokajty, 4.5.1897. *Korshinsky* (LE). -- Prov. Buchara: SW' Kyzyl-kum, zwischen den Brunnen "Tzaspek-Koskan" und "Atdzhan", 22.6.1932, *Nikitin 325* (LE) - SW' Kyzyl-kum, Brunnen "Adyn-bai", 7.6.1932, *Nikitin 162* (LE) - 12 km W Brunnen "Tasch-kuduk", 29.5.1948, *Rodin & Arkadev 178* (LE).

6. **Astragalus lehmannianus** Bunge in Arb. naturf. Ver. Riga 1: 252. 1847 ≡ *A. sphaerophysa* Kar. & Kir. ß. *lehmannianus* (Bunge)Kuntze in Trudy Imp. S.-Petersburgsk. Bot. Sada 10: 184. 1887. **Syntypen:** In der Steppe Kara-kum beim Aral-see, am Brunnen Estak-Kuduk, 1.7.1841, *Lehmann* (P!, W!); Lehmsandsteppe unweit Karataga, 17.4.1842, *Lehmann* (P!). **Lectotypus** (hoc loco designatus): In der Steppe Kara-kum beim Aralsee, am Brunnen Estak-Kuduk, 1.7.1841, *Lehmann* (P!).

Abb.: BUNGE, A., Icon.: tab. 15. 1847. Fl. USSR 12: Plate 27, fig. 3. 1946. Fl. Turkmenii 4: 234, tab. 47, fig. 3. 1949. Fl. Kazakhstana 5: 183, tab. 25, fig. 1. 1961.

Pflanzen ausdauernd, 35-65 cm hoch. Stengel 25-50 cm lang, aufrecht, kräftig, kantig gefurcht, wirr abstehend behaart, zum Schluß verkahlend. Nebenblätter grün, aus breitem Grund dreieckig zugespitzt, 8-9 mm lang, abstehend behaart, teilweise am Grund mit dem Blattstiel verwachsen. Blätter 15-27 cm lang; Blattstiel bis 2 cm lang, wie die Rhachis steif, behaart. Blättchen in (6-) 7-10 (-11) Paaren, ziemlich dick, (10-) 15-25 (-30) mm lang und breit, kreisrund oder nahezu so, selten am Grund breit keilförmig, vorne gerundet oder sehr selten schwach ausgerandet, oberseits vor allem gegen den Rand zu mit vereinzelten Haaren, unterseits weich abstehend behaart. Blütenstände sitzend oder mit einem bis 2 cm langen, behaarten Stiel; Traube (7-) 9-14 cm lang, vielblütig. Brakteen grün, linealisch, zugespitzt, 5-6 mm lang, behaart. Blütenstiele 0,5-1 mm lang. Brakteolen änhlich wie die Brakteen, 3-4 mm lang. Kelch zur Blütezeit 11-15 mm lang, röhrig bis schwach bauchig, dicht samtig-zottig behaart; Zähne linealisch, spitz, 4-5 mm lang, innen dicht behaart. Fruchtkelch 17-22 mm lang, eiförmig bis fast kugelig aufgeblasen, dünnhäutig, fein netzartig geadert, samtig behaart. Krone gelb. Fahne 16-20 mm lang; Platte eiförmig bis kreisrund, vorne schwach eingeschnitten, am Grunde in den ebenso langen Nagel verschmälert. Flügel etwa so lang wie die Fahne; Platte schmallänglich, vorne gerundet, 8-10 mm lang und 3-3,5 mm breit; Öhrchen ca. 1 mm lang, Nagel 8-10 mm lang. Schiffchen 15-19 mm lang; Platte schief elliptisch mit breit gebogener Unterkante und fast gerader Oberkante, vorne stumpflich, 7,5-9 mm lang und 4-4,5 mm tief; Öhrchen kurz, Nagel 7,5-9,5 mm lang. Fruchtknoten ca. 2 mm lang gestielt, behaart; Griffel kahl. Frucht mit einem dünnen 2-3 mm langen Stiel, länglich, 7-9 mm lang, an der Bauchseite gekielt, am Rücken gefurcht, vorne mit einem 1-2 mm langen Schnabel; Klappen dünn, samtartig behaart. Hülse sich an der Bauchseite öffnend, zweifächerig, mit 2-4 Samen. Samen ca. 4 mm lang, schwach grubig bis fast glatt, gelbbraun.
Blütezeit: V-VI. **Vorkommen:** Auf Sandböden, fixierten Dünen.

Gesehene Belege:

Kazakhstan. Prov. Aktjubinsk: Temirskij reg., Sande "Kaschkaraf", 19.7.1908, *Skalov 66* (LE) -

Pri-Turkaiskij Piski (Sande), N vill. Kok-Kabak, 21.6.1914, *Dessiatoff 1026* (LE) - Tschelkarskij reg., 55 km SE des Sees Naschkar-ata, 19.8.1927, *Spiridonov 1251* (LE) - Tschelkarskij reg., Maly Bazurki, 30 km SSW Stat. Kara-Tschokat, 28.6.1927, *Sergiev 131* (LE). -- Prov. Gurev: Ust-Urt plateau, Sande "Sam" bei Sapry-Kandyk, 29.6.1906, *Dubianski 281* (LE) - Halbinsel Mangischlak nahe den Sanden "Ak-tjube", 11.5.1906, *Dubianski 276* (LE) - Gurevskij reg., nahe dem Brunnen "Sedak-kul", 29.9.1926, *Basilievskaja* (LE) - Ural-Emben reg., zwischen dem See Nur und Bij-Bid, 13.8.1936, *Nikitin & Deulina* (LE) - Fluß Emba bei Karascha-kul (etwas oberhalb der Mündung in die Kaspi-See), 26.6.1927, *Nikitin 277* (LE) - river Emba, 2.6.1904, *Dubianski 599* (LE) - Adaevskij reg., zwischen Fluß Emba und Ust-Urt, Sande "Sary-Kul", 12.5.1926, *Spiridonov 1251* (LE). -- Prov. Kzyl-Orda: Akdschulpas an der N'Seite des Aral Sees, 21.5.1881, *Regel* (LE) - bei Stat. Aralskimore, 16.5.1909, *Androssov* (LE) - Kazalinskij reg., Karakum, an der Straße Kis - Iktschina, 21.8.1929, *Lipschitz 780* (LE) - Priaralsk. Karakum, Sand "Sanak" beim Brunnen "Nurlybai", 25.7.1930, *Jarmolenko & Nikitin 155* (LE) - Karakum, 46°50' N, 34°00' (nach Leningrad-Koordinate, Greenwich 64°00') E, *28.7.1914, Spiridonov* (LE) - Kazalinskij reg., bei Stat. Maili-basch, 20.5.1909, *Androssov* (LE) - ad littore lac. Aral, Alty-kuduk, 16.6.1900, *Berg* (LE) - Bucht Kos-Aral am Aral-See, an der Mündung des Kara-Tereni, 5.7.1921, *Raikova* (LE) - inter Bik-tau und Bil-kuduk, E des Aralsees, 14.11.1857, *Borszczow 576* (LE) - Priaralsk. Kyzyl-kum, Brunnen "Tschielikuduk", 24.6.1957, *Rothschild 568* (LE). -- Nicht genau lokalisierbar: zwischen Stat. Sannak und Bek Bauli, 16.6.1904, *Fedtschenko* (LE).

Uzbekistan. Autonome Republik Karakalpak: Aral See, Insel Tokmak-Ata, bei Muinak, 9.6.1921, *Raikova* (LE).

7. **Astragalus leiophysa** Bunge in Trudy Imp. S.-Petersburgsk. Bot. Sada 3: 104. 1874. **Holotypus:** in deserto Kisil-kum a monte Karak usque ad Korshun, V.1871, *O. Fedtschenko* (P!).

= *A. jaxarticus* Bond. in Not. Syst. Herb. Inst. Bot. Acad. Sci. Uzbek. 16: 3. 1961, nom. illeg. non Pavlov 1935 ≡ *A. aleschii* Bond. in Bjull. Vsesojuzn. Inst. Rasteniev. 81: 37. 1978. **Syntypen:** ad arenas secus fl. Syr-Darja sitas in loco Bajtugaj, occidentem versus ab urbe Taschkent, 18.5.1926, *Kultiassov 281, 282, 283, 284* (TAK, non vidi).

Pflanzen ausdauernd, 30-110 cm hoch. Stengel aufrecht, kräftig, 18-70 cm lang, fein gefurcht, am Grunde dicht wollig behaart, sonst weniger behaart bis verkahlend oder selten kahl. Nebenblätter schmaldreieckig-zugespitzt, 8-12 mm lang, außen kahl oder ± abstehend behaart, am Rande gewimpert, die unteren oft mit dem Blattstiel verbunden. Blätter 17-30 cm lang; Blattstiel 3-5 cm lang, wie die Rhachis ± abstehend behaart, seltener kahl. Blättchen in (6-) 7-10 Paaren, (8-) 10-21 mm lang, kreisrund bis breit eiförmig, vorne gerundet, oberseits kahl oder selten gegen den Rand zu spärlich behaart, unterseits weich fast anliegend behaart oder mit Ausnahme der Nerven kahl. Blütenstände sitzend, dicht 17-vielblütig, 5-7 cm lang. Brakteen grün, linealisch, spitz, 6-7 mm lang, gewimpert. Blütenstiele ca. 1 mm lang. Brakteolen ähnlich den Brakteen, bis 4 mm lang. Kelch zur Blütezeit 12-13 mm lang, kurzröhrig, weichhaarig oder bis auf den oberen Rand und die Zähne kahl; Zähne linealischspitz, 3-4 mm lang, halb so lang wie die Röhre, auf der Innenseite dicht behaart. Fruchtkelch 15-18 mm lang, eiförmig aufgeblasen, dünnhäutig, fein netzartig geadert, behaart oder bis auf den oberen Rand und die Zähne kahl, Zähne aus dreieckiger Basis zugespitzt, 4-5 mm lang. Krone gelb, zuweilen sich rötend. Fahne 17-18 mm lang; Platte eiförmig bis breiteiförmig, 6-7 mm breit, vorne gerundet, am Grund in den etwas kürzeren Nagel verschmälert. Flügel etwas länger als die Fahne; Platte schmallänglich, nach oben zu etwas verschmälert, gerundet, 8-9 mm lang; Öhrchen kurz, Nagel 8-9 mm lang. Schiffchen so lang wie die Fahne; Platte schief-elliptisch-dreieckig, mit gebogener Unterkante und fast gerader Oberkante, vorne stumpf, 6-7 mm lang; Nagel 10-11 mm lang. Fruchtknoten ca. 2 mm lang gestielt, kahl. Frucht 2-3 mm lang gestielt, 6-7 mm lang, ca. 4 mm hoch und 3 mm breit, an der Bauchseite gekielt, am Rücken ge-furcht,

vorne mit einem 1,5-2 mm langen Schnabel; Klappen dünn, kahl. Hülse unvoll-ständig bis vollständig zweifächerig, zweisamig, Septum 2/3 bis 1/1 der Fruchthöhe erreichend. Samen ca. 4 mm lang und 2,5 mm breit, glänzend, rötlichbraun, schwach wellig-grubig.
Blütezeit: V-VI. **Vorkommen:** auf Sand.
Verbreitung: Kazakhstan: Kyzylkum, Tal des Syrdarja.

Gesehene Belege:

Kazakhstan. Prov. Ksyl-Orda: zwischen Perowsk [= Ksyl-Orda] und Kara Uzjak, 3 werst von Bidai Kul, 12.5.1914, *Krascheninnikov* (LE, P) - zwischen Ksyl-Orda und dem See Bescgh-Mulla, 11.6.1926, *Gorschkova 127* (LE) - 20-25 km von Ksyl-Orda, 14.6.1929, *Smirnov 25* (LE) - Perovskij reg., Stat. Tschili, 29.5.1910, *Knorring & Minkwitz 112* (LE) - Perovskij reg., bei Sadyr-Arik, 26.5.1914, *Spiridonov* (LE) - Ksyl-Ordinskaja reg., zwischen Bisch-arna und Sadr-Saraj, 14.6.1929, *Pavlov 114* (LE) - Perovskij reg., beim See Kunak kul, 24.5.1914, *Spiridonov 403* (LE) - ad lacum Aral, Atalyk-Aral, 16.5.1849, *Bukakov* (LE). -- Prov. Juzhno-Kazakhstan: Tschimkentskij reg., E von Bai-Tugai, am Fluß Syr-Darja, 18.5.1926, *Kultiassov 289* (LE).
Uzbekistan. Autonome Republik Karakalpak: Kyzyl-kum, W Kuduk Ujgensk, 24.5.1932, *Russanov 214* (LE) - Kyzyl-kum, ENE Dzhulaj, an der Straße nach Toguzbai, 26.5.1932, *Afanassjev 118* (LE) - Kyzyl-kum, beim Brunnen "Baskara", 1932, *Poretzki* (LE) - Kyzyl-Kum, bei Dzhingildy, 30.5.1932, *Poretzki* (LE). -- Prov. Samarkand: S' Kyzyl-kum, bei Kolchose Terskendy, 16.5.1957, *Kurotschkina* (LE) - S' Kyzyl-kum, beim Brunnen "Tischte-bai, 31.5.1914, *Michelson* (LE) - S' Kyzyl-kum, Kolchose Nalivai, 6.6.1957, *Kurotschkina* (LE) - Kyzyl-kum, Brunnen "Schakyr", 22.4.1915, *Spiridonov* (LE) - Kyzyl-kum, Nuratinskij reg., Kzyltscha, 6.6.1954, *Zaprometova* (LE) - Dzhizaksk. & Khoshentsk. reg., Golodnaja step, beim Ort Tischo, 27.4.1915, *Spiridonov* (LE). -- Prov. Taschkent: loco Aizi-kul, 24.5.1914, *Minkwitz 172* (LE) - zwischen Orsk und Taschkent, V.1870, *Fedtschenko* (LE). -- Prov. Syr-darinsk: Bei Stat. Baigakuun, 4.6.1907, *Androssov 110* (LE).

8. Astragalus litwinowii Lipsky in Trudy Imp. S.-Petersburgsk. Bot. Sada 8: 39. 1900.
Holotypus: Turkmenia, via ad Agamet, 15.5.1887, *Walter* (LE!).

Pflanzen ausdauernd, im vegetativen Teil nahezu kahl, Haare im Infloreszenzbereich weiß. Stengel 35-65 cm hoch, aufrecht oder niederliegend, kantig gefurcht, kahl. Nebenblätter grün, 7-10 mm lang, aus breit dreieckigem, stengelumfassendem Grund zugespitzt oder selten dreieckig, am Rande spärlich gewimpert, unter sich und vom Blattstiel frei. Blätter 10-27 cm lang; Blattstiel 3-6 cm lang, wie die Rhachis fein gestreift, kahl. Blättchen in 4-9 Paaren, entfernt stehend, (8-) 15-35 (-40) mm lang und (4-) 7-17 (-20) mm breit, eiförmig, vorne spitzlich bis spitz, seltener gerundet mit einem Stachelspitzchen, kahl oder selten am Rande spärlich kurz gewimpert. Blütenstände fast sitzend oder die unteren bis 2 cm lang gestielt; Traube 12-18 cm lang, locker vielblütig; Traubenachse spärlich kurz abstehend behaart. Brakteen grünlich, linealisch spitz, 4-6 mm lang, gewimpert. Blütenstiele 1-2 mm lang, behaart. Brakteolen linealisch, 1,5-2 mm lang, gewimpert, meist im oberen Teil der Blütenstiele ansitzend. Kelch zur Blütezeit 9-13 mm lang, röhrig oder schwach bauchig, meist schmutzig rötlich überlaufen, locker bis ziemlich dicht mit 0,3-1 mm langen abstehenden Haaren besetzt, seltener fast kahl; Zähne dreieckig zugespitzt, 2-3 mm lang, auf der Außenseite locker, auf der Innenseite und am Rande dicht behaart. Fruchtkelch 22-28 mm lang, ellipsoidisch aufgeblasen, dünnhäutig, deutlich netzartig geadert, rasch verkahlend bis ganz kahl. Krone (getrocknet) gelblich oder weißlich-purpurn mit purpurfarbenem Schiffchen. Fahne 24-27 (-30) mm lang; Platte 9-10 mm breit, eiförmig bis elliptisch, vorne deutlich eingeschnitten,am Grunde plötzlich in den langen Nagel zusammengezogen. Flügel 22-25 (-28) mm lang; Platte schmallänglich, schwach gebogen, vorne gerundet, ca. 11 mm lang und 2,5-3 mm breit; Öhrchen breit, 0,5-0,8 mm lang, Nagel 12-13 mm lang. Schiffchen 21-24 (-26) mm lang; Platte schiefelliptisch

gebogen, mit sehr breit rechtwinklig gebogener Unterkante und konkaver Oberkante, vorne gerundet, ca. 11 mm lang und 4-4,5 mm tief; Öhrchen breit, kurz, Nagel 12-13 mm lang. Staubfadenröhre schwach stufig abgeschnitten. Fruchtknoten 3-4 mm lang gestielt, kahl; Griffel dünn, lang. Frucht mit einem seitlich am Grunde ansitzenden, 4-5 mm langen Stiel, 8-11 mm lang, 4-5 mm hoch und 3-3,5 mm breit, an der Bauchseite ± scharf gekielt, am Rücken gefurcht, vorne in einen kurzen Schnabel zusammengezogen; Klappen dünn, ± deutlich quernervig, kahl oder zuweilen mit vereinzelten Haaren besetzt. Hülse sich an der Bauchseite öffnend, fast vollständig zweifächerig, meist zweisamig.
Blütezeit: IV-V. **Vorkommen:** auf Sanden.
Verbreitung: Turkmenistan (Karakum, Karabil, Badghys, zentraler Kopet Dagh), Iran.

Gesehene Belege:

Turkmenistan. Prov. Ashkhabad: Ashabad, 10.4.1893, *Korshinsky 1161* (LE) - zwischen Stat.-Annau und Gjaurs, 4.5.1954, *Nikitin* (BM, MA, W) - dto., 7.5.1975, *Nikitin & Ivanov* (M) - dto., 14.5.1911, *Michelson 174* (LE) - ad fl. Tedshen prope Karrybent, 8.4.1898, *Litwinow 1243* (LE). -- Prov. Mary: Dolina Murghab near Stat. Imam-Baba, 28.4.1930, *Gorshkova 99* (LE) - zwischen Imam-baba und Sultan-bent, 17.5.1916, *Dubjansky* (LE) - Reg. Murgab, near Stat. Tash-Kepri, 28.6.1906, *Klingen 1213* (LE) - Mervskij reg., Sary-Jazy Stat., 7.4.1912, *Michelson 692* (LE) - near Kushk, 21.4.1904, *Androssov* (LE). -- Prov. Tschardzhous: Repetek, 5.4.1910, *Michelson 93* (LE) - Karakum, Quelle "Osman", 8.5.1926, *Basilevskaja 184* (LE). -- Nicht genau lokalisierbar: Karakum, zwischen Stat. Anenkova und Dorf Kara-kuju, IV.1910, *Bukinitsch* (LE) - nahe Kzyl-Atsch (Ajaka ?), 2.5.1930, *Zinoviev 42* (LE).
Iran. Prov. Khorasan: 20 km a Mozduran versus Sarakhs, 650 m, 26.4.1989. *Mozaffarian 67665* (TARI, Hb. PODL.).

9. Astragalus maximowiczii Trautv. in Trudy Imp. S.- Petersburgsk. Bot. Sada 9: 379. 1884.
Typus: Plantam hanc vel in districtu Achalteke Turcomaniae vel in provincia Karabach Transcaucasiae *Christoph* invenit (LE!).
Anmerkung: Da *A. maximowiczii* in Transkaukasien nicht vorkommt, ist der locus classicus mit Sicherheit in Turcomania gelegen.

Abb.: Flora USSR 12: 405, tab. 27, fig. 2. 1946. Fl. Turkmenii 4: 234, tab. 47, fig. 2. 1949.

Pflanzen 50-70 cm hoch. Stengel kräftig, oft zickzackartig gebogen, kantig gefurcht, 45-60 cm lang, locker bis ziemlich dicht mit sehr dünnen, 0,3-0,5 mm langen, wirr abstehenden Haaren bedeckt, zuweilen verkahlend. Nebenblätter grün, aus sehr breiter, den Stengel und den Blattstiel umschließender Basis kurz dreieckig zugespitzt, frei, 7-10 mm lang, am Rande locker bis dicht gewimpert. Blätter 10-30 cm lang, fast waagerecht abstehend; Blattstiel 2-5 cm lang, wie die Rhachis fein gefurcht und wie der Stengel behaart. Blättchen in 5-7 (-10) Paaren, entfernt stehend, 20-40 (- 50) mm lang und 12-35 mm breit, elliptisch bis breit eiförmig, vorne stumpflich bis gerundet und mit einem aufgesetzten Spitzchen, oberseits kahl, unterseits locker bis dicht mit sehr kurzen, fast anliegenden Haaren besetzt, zuweilen verkahlend, am Rande dicht gewimpert. Blütenstände fast sitzend, 12-14 cm lang, locker vielblütig; Traubenachse ähnlich wie der Stengel behaart. Brakteen grünlich, schmaldreieckig, 4-8 mm lang, behaart. Blütenstiele 1-1,5 mm lang, abstehend behaart. Brakteolen linealisch, 1-2 mm lang, im oberen Teil des Blütenstiels oder am Grunde des Kelches angeheftet. Blütenkelch 11-13 mm lang, röhrig, dicht kurzzottig behaart; Zähne schmaldreieckig-zugespitzt, 2-3 mm lang, auf der

Innenseite dicht behaart; Fruchtkelch eiförmig aufgeblasen, 25-30 mm lang, dünnwandig, meist purpurn überlaufen, dicht fein netzartig geadert, locker kurzhaarig bis verkahlend. Krone im Leben hell purpurfarben, getrocknet gelblich oder schwach rötlich überlaufen. Fahne 22-30 mm lang; Platte schmalelliptisch, 7-8 mm breit, vorne eingeschnitten, am Grunde keilig in den Nagel verschmälert. Flügel 20-28 mm lang; Platte schmallänglich, vorne gerundet, 10-12 mm lang und 2,5-3,5 mm breit; Öhrchen breit gerundet, 1-1,5 mm lang, Nagel 10-15 mm lang. Schiffchen 20-27 mm lang; Platte schiefelliptisch-dreieckig, mit breit gebogener Unterkante und fast gerader bis schwach konkaver Oberkante, vorne stumpf gerundet, 10-12 mm lang und ca. 5 mm tief; Öhrchen stumpf, ca. 1 mm lang, Nagel 10-15 mm lang. Staubfadenröhre fast gerade abgeschnitten. Fruchtknoten 3-4 mm lang gestielt, spärlich bis locker behaart. Frucht 4-5 mm lang gestielt, elliptisch, 8-11 mm lang, ca. 4 mm hoch und 3 mm breit, an der Bauchseite gekielt, am Rücken tief gefurcht, vorne mit einem ca. 3 mm langen Schnabel; Klappen dünn, quernervig, spärlich kurz abstehend behaart bis verkahlend. Hülse fast vollständig zweifächerig.
Blütezeit: III-IV. **Vorkommen:** Trockene und sandige Böden.
Verbreitung: Turkmenistan, Uzbekistan.

Gesehene Belege:

Turkmenistan. Prov. Askhabad: near Aschabad, 10.4.1895, *Korshinsky 1161* (LE) - dto., 25.4.1898, *Litwinow 1242* (LE, W) - dto., 27.4.1930, *Litwinow 201* (G) - dto., 12.4.1932, *Androssov* (LE) - Germab, 24.5.1886, *Radde 567* (LE) - zwischen Annaju und Gjaurs, IV.1900, *Sintenis 100* (B, BM, K, LD, LE, P, W) dto., 7.5.1975, *Nikitin & Ivanov* (BM, MA, W) - NE Stat. Annau, 18.5.1952, *Tzvelev* (LE) - Duschak, 13.4.1915, *Korovin 371* (LE) - Stat. Takyr, 19.5.1896, *Lipsky 4573* (LE) - 35 km SW Tedzhen, 27.4.1963, *Gubanov* (LE) - zwischen dem See Khauz-Khan und der Brücke über den Karakum-Kanal N Serakhs, 24.4.1964, *Botschantzev & al. 116* (LE) - 20 werst SE Serakhs, 30.4.1915, *Korovin 714* (LE). -- Prov. Mary: Stat. Dort-kuju, 6.4.1912, *Androssov* (LE) - Imam Baba, 10 werst vom Fluß Murghab, 17.4.1926, *Dubiansky 307* (LE) - Badghyz, prope stat. Sary-Jazy, 24.4.1930, *Butkov* in Herb. Fl. SSSR *6224* (BM, LE, M, P, W) - Badghyz, Tal Kzyl-dzhar, NE des Sees Er-oilan-dus, 27.4.1964, *Botschantzev & al. 268* (LE) - Kuschk, 15.4.1910, *Michelson 219* (LE) - Reg. Kuschk, bei Gelle-tschegill, 12.4.1912, *Lipsky 848* (LE) - Reg. Kuschk, beim Grenzposten Tschilduchter, 27.3.1912, *Michelson 283* (LE) - Reg. Kuschk, Kazetschenek, 10.4.1912, *Lipsky 802* (LE) - Kuschk, reg. Karabil, 11.4.1912, *Lipsky 808* (LE, M). -- Prov. Tschardzhous: Jugo SE Karakum, Brunnen "Osman Ajuk", 30.4.1926, *Korovin 903* (LE) - Karakorum, Kelifski Uzboi, beim Brunnen "Kum-Tschai", 7.4.1925, *Dubiansky* (LE) - Kara-kum, beim Brunnen "Juzgenli", 5.4.1925, *Dubiansky* (LE) - Karakorum, Tal des Flusses Balkha, 10.4.1925, *Dubiansky 74* (LE). -- Nicht genau lokalisierbar: Islim-Tscheschme, 17.4.1916, *Korovin 423* (LE) - Kara-kum, beim Brunnen "Bisch-kak", 27.4.1925, *Dubiansky* (LE).

Uzbekistan. SSW of Bek-Budi, 8 werst SSW Tscharagyl, 23.5.1928, *Linczevski 323* (LE). (Keine Angabe in Flora Uzbekistan).

10. Astragalus rassulovae Podlech, spec. nov.

Holotypus: Persia, Prov. Khorasan, Steppe zwischen Birdschend und Torbat-e-Hejdari, 1480 m, 12.5.1939, *Gauba 935* (B!; Iso: B!).

differt ab *A. maximowiczii* Trautv. indumento e pilis longioribus consistente, foliolis minoribus latioribusque, calyce in tempore florendi 14-16 mm longo, dentibus ejus anguste triangularibus 5-7 mm longis, legumine latiore altioreque glabro.

Plantae erectae, 30 cm altae vel altiores, caulibus dense patule villosis. Stipulae virides, e basi semiamplexicaule triangulariter acuminatae, margine ciliatae, liberae, 5-10 mm longae.

Folia 12-22 cm longa, petiolo 3-6 cm longo, sicut rachis densiucule breviter patule villoso. Foliola 7-8 juga, remota, ± orbicularia, 8-20 x 8-24 mm, supra glabra, subtus densiucule villosa. Racemi subsessiles, multiflori. Bracteae viridusculae, lineares, 4-6 mm longae. Bracteolae 1-2 mm longae. Calyx tempore florendi tubulosus vel leviter ventricosus, 14-16 mm longus, , dense patule villosus, dentibus anguste triangularibus 4-7 mm longus, extus longe villosis, intus glabris vel appresse pilosis; calyx tempore fructificationis 20-28 mm longus, ovati-inflatus. Corolla flava. Vexillum 26-30 mm longum, lamina 9-10 mm latum. Alae vexillo aequilongae. Carina 24-28 mm longa. Ovarium stipite ca. 2 mm longo suffultum, glabrum. Legumen stipte 3-4 mm longo suffultum, ovatum, ca. 12 mm longum, 8 mm altum et 6 mm latum, glabrum, biloculare.

Pflanzen ausdauernd, mit dünnen, oft geknickten und gebogenen, weißen, 0,3-1 mm langen, am Kelch auch bis 1,5 mm langen Haaren besetzt. Stengel aufrecht (unvollständig), mindestens 30 cm lang, kräftig, fein kantig-gestreift, ± dicht abstehend behaart. Nebenblätter grün, aus breitem, den Blattstiel öhrchenartig umfassendem Grund dreieckig zugespitzt, am Rande gewimpert, vom Blattstiel frei, 5-10 mm lang, an den obersten Blättern häufig kürzer. Blätter 12-22 cm lang, die unteren länger als die oberen; Blattstiel 3-6 cm lang, wie die Rhachis fein gestreift, ziemlich dicht kurz abstehend behaart. Blättchen in 7-8 Paaren, entfernt stehend, 8-20 mm lang und 8-24 mm breit, ± kreisrund oder quereiförmig und breiter als lang, vorne breit gerundet bis sehr schwach ausgerandet, am Grunde breit quergestutzt bis sehr breit keilförmig, oberseits kahl, unterseits ziemlich dicht wirr fast anliegend behaart. Blütenstände fast sitzend, vielblütig, zunächst sehr dicht, bis 6 cm lang, später sich etwas verlängernd; Traubenachse wie der Stengel behaart. Brakteen grünlich, linealisch, 4-6 mm lang, gewimpert. Blütenstiele 1-2 mm lang, behaart. Brakteolen linealisch, 1-2 mm lang, gewimpert, im oberen Teil der Blütenstiele ansitzend. Kelch zur Blütezeit 14-16 mm lang, röhrig bis schwach bauchig, oft schmutzig rötlich überlaufen, dicht ± wirr abstehend behaart; Zähne schmaldreieckig, 4-7 mm lang, außen und am Rande langhaarig, auf der Innenseite kahl oder anliegend behaart. Fruchtkelch 20-28 mm lang, eiförmig aufgeblasen, dünnhäutig, fein netzig geadert, ziemlich dicht wirr abstehend behaart. Krone gelb. Fahne 26-30 mm lang; Platte 9-10 mm breit, elliptisch, vorne deutlich eingeschnitten, am Grunde in den etwas kürzeren Nagel zusammengezogen. Flügel etwa so lang wie die Fahne; Platte schmallänglich, vorne gerundet, 14-15 mm lang und ca. 4 mm breit; Öhrchen sehr breit, 1-1,5 mm lang, Nagel 12-14 mm lang. Schiffchen 24-28 mm lang; Platte schiefelliptisch mit breit bucklig gebogener Unterkante und fast gerader Oberkante, vorne gerundet, 13-14 mm lang und ca. 6 mm tief; Öhrchen breit, kurz, Nagel 12-15 mm lang. Staubfadenröhre gerade bis schwach stufig abgeschnitten. Fruchtknoten ca. 2 mm lang gestielt, kahl; Griffel dünn, lang. Frucht 3-4 mm lang gestielt, eiförmig, ca. 12 mm lang, 8 mm hoch und 6 mm breit, an der Bauchseite gekielt, am Rücken tief gefurcht, vorne mit einem dünnen, ca. 2 mm langen Schnabel; Klappen dünn, strohfarben, kahl, sehr fein quernervig. Hülse sich an der Bauchseite öffnend, vollständig zweifächerig, zweisamig. Samen (unreif).
Blütezeit: V. **Vorkommen:** in Steppen.
Verbreitung: Iran (Khorasan).

Gesehene Belege:

Iran. Khorasan: 25 km SE Sabzevar, 940 m, 2.5.1976, *Rejamand & Bazargan 31775* (W) - Steppe zwischen Birdschend und Torbat-e-Hejdari, 1480 m, 12.5.1939, *Gauba 935* (B).

11. Astragalus sphaerophysa Kar. & Kir. in Bull. Soc. Imp. Naturalistes Moscou 15: 338. 1842 ≡ *Tragacantha sphaerophysa* (Kar. & Kir.)Kuntze, Revis. Gen.: 948. 1891 ≡ *A.*

sphaerophysa var. *normalis* Kuntze in Trudy Imp. S.-Petersburgsk. Bot. Sada 10: 184. 1887. **Syntypen:** in collibus sabulosis Songoriae inter montes Arganaty et fontem Sassyk-pastau, VI.1841; inter montes Arganaty et Dschiiss-ahatsch ad fl. Ajagus, VIII.1841, *Karelin & Kirilov* (BM!). (Die Syntypen wurden auch gemischt als *Karelin & Kirilov 1410* ausgegeben: M!, P!). = *A. sphaerophysa* var. *multifoliolatus* Kuntze in Trudy Imp. S.-Petersburgsk. Bot. Sada 10: 184. 1887. **Typus:** Turkmenen-Steppe, *Kuntze* (non vidi).

Abb.: Fl. Kazakhstana 5: 183, tab. 25, fig.2. 1961.

Pflanzen ausdauernd, 27-50 cm hoch, mit dünnen weißen Haaren besetzt. Stengel 23-37 cm lang, kräftig, kantig gefurcht, im unteren Teil verkahlend oder kahl, im oberen Teil spärlich bis locker mit 0,5-1 mm langen, wirr fast anliegenden Haaren besetzt. Nebenblätter schmaldreieckig bis fast linealisch, zugespitzt, 8-12 mm lang, am Rande mit bis 2 mm langen Wimpern besetzt und meist auch auf der Fläche behaart, am Grunde ± hoch mit dem Blattstiel verbunden. Blätter (6-) 10-15 (-20) cm lang; Blattstiel 2-3 cm lang, wie die Rhachis spärlich bis locker abstehend behaart, seltener ziemlich kahl. Blättchen in 4-7 Paaren, entfernt stehend, (14-) 20-25 (-30) mm lang, breit verkehrteiförmig bis kreisrund, vorne breit gerundet, oberseits kahl, unterseits und am Rande ziemlich dicht mit 0,3-1 mm langen, wirr fast anliegenden Haaren bedeckt. Blütenstände sitzend, dicht 12-25 blütig, in Blüte kugelig bis eiförmig, 3-5 cm lang, zur Fruchtzeit verlängert, bis 8 cm lang. Brakteen schmaldreieckig, fein zugespitzt, 8-10 mm lang, am Rand zottig gewimpert. Brakteolen schmallinealisch, zugespitzt, 5-7 mm lang, gewimpert. Kelch zur Blütezeit 12-14 mm lang, röhrig bis schwach bauchig, nur im oberen Teil und an den Zähnen weißhaarig; Zähne pfriemlich, 4-5 mm lang, halb so lang wie die Röhre, auf der Innenseite spärlich bis dicht behaart. Fruchtkelch kugelig bis eiförmig aufgeblasen, 15-20 mm lang, dünnhäutig, dicht netzartig geadert, fast kahl mit Ausnahme des oberen Randes und der ca. 5 mm langen Zähne. Krone gelb. Fahne 15-20 mm lang; Platte kreisförmig oder fast kreisförmig, 7-9 mm breit, vorne schwach ausgerandet, am Grunde in den etwa gleich langen bis längeren Nagel verschmälert. Flügel etwa so lang wie die Fahne; Platte schmallänglich, vorne gerundet, 6-7 mm lang und ca. 2 mm breit; Öhrchen ca. 1 mm lang, Nagel ca. 14 mm lang. Schiffchen 14-18 mm lang; Platte schiefelliptisch-dreieckig, mit bucklig gerundeter Unterkante und schwach konkaver bis fast gerader Oberkante, vorne stumpf, ca. 6 mm lang und 2,5 mm tief; Öhrchen kurz, Nagel ca. 13 mm lang. Staubfadenröhre ± gerade abgeschnitten. Fruchtknoten 2-3 mm lang gestielt, kahl. Frucht mit einem 3-4 mm langen, dünnen Stiel, länglich-oval, 5-9 mm lang, ca. 3,5 mm hoch und breit, an der Bauchseite gekielt, am Rücken tief und breit gefurcht, vorne mit einem 1-2 mm langen Schnabel; Klappen dünn, kahl. Hülse sich an der Bauchseite öffnend, wenigsamig, unvollständig zweifächerig, Septum 2/3 - 3/4 der Fruchthöhe erreichend. Samen ca. 4 mm lang und 2-2,5 mm breit, dunkelbraun, schwach runzlig, matt.
Blütezeit: V-VI. **Vorkommen:** Feste Sandflächen und Dünen.
Verbreitung: Kazakhstan: Umgebung des Balkhash-Sees; China.

Gesehene Belege:

Kazakhstan. Prov. Alma-Ata: 4o km SE Stat. Aktogai, 7.7.1953, *Rusjaeva* (LE) - Fluß Ili, Mündung des Kurd-Tschilik, 24.5.1929, *Rusanov 5* (LE) - linkes Ufer des Flusses Kurtu, zwischen Sary-Kemir und Kara-su, 10.6.1926, *Titiv & Joffe 385* (LE) - mittlerer Ili, bei Kaptschigai, 3.6.1956, *Goloskokov* (LE) - Ili-Balchaschsk. reg., Brunnen "Dzhainak" an der Straße Altscha-Dzhainak nach Dzhul, 14.5.1908, *Sokolov 673* (LE) - Ili-Balchaschsk. reg., Sary-Mantal, 20.5.1908, *Sokolov 709* (LE) - bei Ilisk, 7.6.1955, *Goloskokov* (LE) - dto., 18.6.1895, *Chaffanjon 641* (P) - zwischen Ilisk und Stat. Tschingildy, 19.6.1908, *Ptaschicki 340* (LE) - sables de Tschinguilde, 18.6.1895, *Chaffanjon 642* (P). -- Prov. Taldy-Kurgan: ad flumen Lepsa, loco Sary-tologoi, 2.8.1934, *Linczevsky & al. 557* (LE) -

Najman-mulla, 5.5.1902, *Saposhnikov* (LE) - Steppe am Fluß Karatalu, zwischen Tassu-at und Utschmulla, 6.5.1902, *Saposhnikov* (LE) - SW Stat. Dzhurzagatsch gegen den Balkhasch See, 27.6.1890, *Korshinsky* (LE) - Kopalsk. reg., zwischen Mailibas und Dzhanabaj, 15.5.1913, *Schischkin & Genina* (LE) - Kopalsk. reg. zwischen Bok-kara und Biskul, 12.5.1913, *Schischkin & Genina* (LE) - Kopalsk. reg. zwischen Kos-Kul und Korusom, 22.5.1913, *Schischkin & Genina* (LE) - Kopalsk. reg., bei Djongene am Fluß Koksu, *Mukhin 16* (LE).

China. Chorgos, am Fluß Ili, 1886, *Krassnow* (LE).

12. Astragalus tatjanae Lincz. in Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 7: 173. 1938. **Holotypus:** Montes Transoxanae, distr. Kurgan-tjube, in promontoriis occiden-talibus montium Utunczi orientem versus ab urb. Kurgan-tjube, 10.5.1936, *T. Maslennikova 183* (LE!).

= *A. tashqurghanicus* Rech.f. & Podlech in Mitt. Bot. Staatss. München 11: 269. 1973. **Holotypus:** Afghanistan, Prov. Samangan, Samangan Tal 3 km S Sayad, an der Straße von Tashqurghan nach Aybak, 680 m, 27.4.1971, *Podlech 20996* (M!; Iso: E!, G!, LE!, M!, W!, Herb. PODL.!).

Abb.: LINCZEVSKY in Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 7: 175. 1938. PODLECH in Mitt. Bot. Staatss. München 11: 270, Abb. 9 (Habitus) und 271, Abb. 10 (Blütenteile) (als *A. tashqurghanicus)*. 1973. Fl. Tadzhikskoi SSR 6: 233, tab. 37, fig. 1-2. 1981.

Pflanzen ausdauernd, spärlich mit weißen ± abstehenden langen Haaren besetzt. Stengel einzeln oder zu 3-4, niederliegend bis aufsteigend, seltener aufrecht, oft hin und her gebogen, 70-120 cm lang, dünn gefurcht, kräftig, am Grund bis 10 mm dick, kahl oder im oberen Teil spärlich mit 1,5-3 mm langen, abstehenden Haaren besetzt. Nebenblätter grün, aus breitdreieckigem, teilweise den Stengel umfassendem Grund zugespitzt, 18-25 mm breit und 12-20 mm lang, am Rand spärlich bis ziemlich dicht gewimpert, unter sich und vom Blattstiel frei. Blätter 22-30 cm lang, die oberen meist nur 12-20 cm lang; Blattstiel 3-7 cm lang, wie die Rhachis kräftig, am Grund bis 4 mm dick, fein gestreift, spärlich mit 1,5-2 mm langen Haaren besetzt. Blättchen in 3-6 Paaren, entfernt stehend, mit einem ca. 2 mm langen, dicht behaarten Stielchen, (30-) 50-80 (-90) mm lang und (28-) 40-70 (-85) mm breit, breiteiförmig bis breitverkehrteiförmig oder fast kreisrund, vorne breit gerundet, oberseits kahl, unterseits vor allem auf den Nerven spärlich bis locker behaart, am Rande gewimpert. Blütenstände in der Achsel der oberen Blätter fast sitzend, locker 15-40 blütig; Traube 15-25 cm lang, zur Fruchtzeit 30-60 cm lang, Traubenachse kräftig, spärlich abstehend behaart. Brakteen grün, schmaldreieckig, 10-20 mm lang, spärlich behaart, am Rande gewimpert. Blütenstiele 2-4 mm lang, behaart. Brakteolen fehlend. Kelch zur Blütezeit 15-20 mm lang, röhrig bis schwach bauchig, oft rötlich überlafen, locker lang abstehend behaart; Zähne schmaldreieckig-zugespitzt, ca. 5 mm lang, auf der Innenseite und am Rande ± dicht anliegend behaart. Fruchtkelch schmaleiförmig bis eiförmig oder elliptisch aufgeblasen, 28-40 mm lang, dünnhäutig, netzartig genervt, weißlich und oft purpurn überlaufen, spärlich bis locker mit abstehenden 1-3 mm langen Haaren besetzt; Zähne 6-9 mm lang. Krone gelb. Fahne 30-40 mm lang; Platte 6-8 mm breit, schmalelliptisch, vorne schmal gerundet, am Grunde allmählich in den halb so langen Nagel übergehend. Flügel 29-38 mm lang; Platte linealisch, vorne gerundet, 16-22 mm lang und 2,5-3,5 mm breit; Öhrchen 1,2-2 mm lang, Nagel 14-18 mm lang. Schiffchen 27-35 mm lang; Platte schmallänglich, gerade vorgestreckt, vorne gerundet, 13-20 mm lang und 3,5-4 mm tief; Öhrchen breit, 1-1,5 mm lang, Nagel 15-18 mm lang. Staubfadenröhre fast gerade abgeschnitten. Fruchtknoten 1,5-4 mm lang gestielt, kahl; Griffel dünn, lang. Frucht 4-5 mm lang gestielt, länglich, 10-20 mm lang, 5-6 mm hoch und ca. 4 mm

breit, seitlich zusammengedrückt, an der Bauchseite gekielt, am Rücken tief gefurcht, vorne mit einem bis 4 mm langen Schnabel; Klappen dünn, kahl. Hülse fast vollständig zweifächerig, wenigsamig. Samen länglich-nierenförmig, 6-7 mm lang und 3,5-4,5 mm breit, rötlichgrün oder olivgrün mit dunkleren Punkten und Flecken, runzlig-grubig, matt.
Blütezeit: III-IV (-V). **Vorkommen:** sandige und lössige Böden, in Ephemerensteppen, unter *Pistacia vera* Gebüsch; 480-920 m.
Verbreitung: Nord-Afghanistan, Süd-Tadzhikistan.

Gesehene Belege:

Tadzhikistan: Gory Ala-Tau, 850 m, 9.4.1937, *Nikitin 374* (LE) - Gory Kara-Tau, 12.4.1937, *Varivtzeva & Grigorjev 35* (LE) - distr. Kurgan-tjube, in promontoriis occidentalibus montium Utunczi orientem versus ab urb. Kurgan-tjube, 10.5. 1936, *T.Maslennikova 183* (LE).
Afghanistan. Prov. Samangan: Koh-i-Damesh Pass, S of Khulm (Tashgurghan), 580 m, *Uotila 16979* (H) - Tang-i-Tashqurghan S Tashqurghan, 500 m, 22.3.1969, *Breckle 954* (Hb. BRECKLE, Hb. PODL.) - dto., 27.4.1969, *Freitag 5083* (Hb. FREITAG, Hb. PODL.) - dto., 11.6.1969, *Ekberg W.9059* (GB) - dto., IV.1970, *Rassoul 529* (M, Hb. PODL.) - 21 km SE Tashqurghan versus Haibak, 600 m, 7.5.1967, *Rechinger 34044* (M, W) - 1 km W Sayad nahe der Straße von Aybak nach Tashqurghan, 650 m, 12.5.1977, *Podlech & Jarmal 30057* (M, Hb. PODL.) - Samangan Tal 3 km S Sayad, 680 m, 27.4.1971, *Podlech 20996* (E, G, LE, M, W, Hb. PODL.). -- Prov. Qunduz: 7 km S Aliabad an der Straße nach Baghlan, 500 m, 8.5.1971, *Podlech 21278* (M, Hb. PODL.) - 10 km S Aliabad, 2.4.1968, *Breckle 982* (Hb. BRECKLE, Hb. PODL.) - Baghlan Tal bei Qezel Say, 600 m, 17.4.1971, *Anders 5650* (Hb. PODL.). -- Prov. Takhar: Qarandu, zwischen Khanabad und Taluqan, 650 m, 1.5.1971, *Anders 6005* (Hb. PODL.). -- **Prov. Baghlan:** 5 km S Pul-i-khumri, 720 m, 19.4.1971, *Anders 5771* (Hb. PODL.) - 10 km S Pul-i-khumri in vallis fluvii Surkhab, 700 m, 4.5.1967, *Rechinger 33688* (M, W).

13. Astragalus winkleri Trautv. in Trudy Imp. S.-Petersburgsk. Bot. Sada 9: 449. 1886.
Typus: Kisil-Arwat, *Trautvetter* (LE!).

Pflanzen ausdauernd, 35-60 cm hoch, mit weichen, dünnen, 0,5-1,5 mm, am Kelch bis 2 mm langen weißen Haaren besetzt. Stengel 20-40 cm hoch, aufrecht, fein längs gefurcht, am Grunde sehr dicht, weiter oben ziemlich dicht bis dicht wirr anliegend bis abstehend behaart. Nebenblätter grün, aus breitem Grund plötzlich schmaldreieckig zugespitzt, 4-6 mm lang, am Rande gewimpert, am Grunde kurz mit dem Blattstiel verbunden. Blätter (10-) 14-23 (-30) cm lang; Blattstiel 1,5-3 (-5) cm lang, wie die Rhachis fein längsstreifig, am Grunde dicht, nach oben hin locker vorwiegend anliegend, zum geringeren Teil auch abstehend behaart. Blättchen in (8-) 12-18 (-20) Paaren, 5-10 (-14) mm lang und 4-10 mm breit, verkehrteiförmig bis rundlich, vorne breit gerundet, am Grunde oft etwas keilförmig, oberseits kahl, unterseits dicht wirr fast anliegend behaart. Blütenstände sitzend oder mit einem bis 2,5 cm langen Stiel, locker vielblütig, 9-13 cm lang, in Frucht bis 17 cm lang; Stiel und Traubenachse wie der Stengel behaart. Brakteen weißlichhäutig oder grünlich, schmal, 4-5 mm lang, gewimpert. Blütenstiele ca. 1 mm lang, behaart. Brakteolen linealisch, 2,5-3 mm lang, am Grunde des Kelches ansitzend. Kelch zur Blütezeit 12-13 (-15) mm lang, röhrig bis schwach bauchig, dicht zottig abstehend behaart; Zähne aus dreieckigem Grund zugespitzt, 3-4 (-5) mm lang, auf der Innenseite behaart. Fruchtkelch 15-20 mm lang, eiförmig aufgeblasen, oft schmutzig rötlich überlaufen, fein netzartig geadert, ziemlich dicht fast abstehend behaart; Zähne aus dreieckigem Grund lang zugespitzt, 4-7 mm lang. Krone gelb. Fahne 16-18 mm lang; Platte ca. 8 mm breit, fast kreisrund, vorne schwach ausgerandet, am Grunde eckig in den fast gleichlangen Nagel zusammengezogen. Flügel so lang wie die Fahne; Platte schmallänglich, vone gerundet, 8-9 mm lang und ca. 2,5 mm breit; Öhrchen ca. 0,5 mm lang, Nagel 8-9 mm lang. 14-17 mm lang; Platte schiefelliptisch-gebogen, mit breit bucklig gebogener Unterkante und konkaver Oberkante, vorne stumpflich, 7-8 mm lang und ca. 3 mm tief; Öhrchen kurz, Nagel 7-9 mm

lang. Staubfadenröhre ± gerade abgeschnitten. Fruchtknoten ca. 2 mm lang gestielt, kahl; Griffel lang, dünn. Frucht mit einem dünnen 3-4 mm langen Stiel, ca. 7 mm lang, 2,5 mm hoch und 3 mm breit, an der Bauchseite gekielt, am Rücken breit und tief gefurcht, vorne mit einem dünnen, ca. 2 mm langen Schnabel; Klappen dünn, hellbraun, fein quer-nervig, kahl. Hülse sich an der Bauchseite öffnend, fast vollständig zweifächerig, 2-samig. Samen länglich, ca. 4 mm lang, braun, fein grubig.
Blütezeit: V. **Vorkommen:** Sandige und steinige Steppen.
Verbreitung: Westliches Turkmenistan.

Gesehene Belege:

Turkmenistan. Prov. Krasnovodsk: N'Teil der Bucht Karabugaz (Kapsi-See), Sande nahe Gory Djul-Djuk-ata, 26.6.1932, *Pobedimova 108* (LE) - Insel Tscheleken im Kaspi See, bei Krasnovodsk, 1875, *Gebel* (LE) - proe Krasnovodsk, 5.6.1901, *Alexeenko* (LE) - B. Balkhan, Stat. Dzhebel, 1927-1928, *Burenko* (LE) - Sand "Mulla Kara" bei Stat. Dzhebel, 7.5.1912, *Andrjuschenko 4093* (LE) - zwischen Stat. Dzhebel und Balla-Ischem, 29.5.1913, *Androssov* (LE) - Balla-Ischem, 24.4.1889, *Antonov* (LE) - B.Balkhan, Sand "Tschil Mamethum" bei Adzhy-kuju, 12.6.1928, *Jarmolenko 2135* (LE) - zwischen Brunnen "Kamal" und "Kjuize-Taur", 25.5.1929, *Schingareva 487* (LE) - M.Balkhan, zwischen Stat. Akhtscha Kuima und Pereval, 30.5.1928, *Bobrov 547* (LE) - Stat. Akhtscha Kuima, NW Kazantschik), 20.6.1929, *Schingareva 134* (LE) - Stat. Afki-kuima, 13.6.1889, *Lipsky* (LE) - zwischen Stat. Ajdin und Pereval, am Fuß der Ajdin-Pereval Kette, 1959, *Gudkova* (LD, W). -- Prov. Ashkhabad: Kizil Arvat, *Trautvetter* (LE). -- Nicht genau lokalisierbar: Kara-kum, 2 km N Schora Mescheryk beim Brunnen "Par", 30.5.1951, *Rodin & al. 91* (LE) - Sand "Khan-baschy" 12 km N des Brunnen "Bug dajli", 13.5.1951, *Rodin & al. 527* (LE) - Kara-Kum, zwischen Brunnen "Kaplanly" und dem See Jaskhan, 28.5.1951, *Rodon & al. 647* (LE).

Astragalus L. sect. **Eremophysopsis** Gontsch. in Fl. USSR 12: 880. 1946.
Typus und einzige Art: *A. sericopetalus* Trautv.

Diese Sektion, deren einzige Art den Arten der Sekt. *Eremophysa* habituell sehr ähnlich ist, unterscheidet sich durch folgende Merkmale: Blütenstände sitzend, fast kugelig, dicht. Krone behaart. Die im Fruchtkelch eingeschlossene Hülse sitzend, sehr dicht seidig anliegend behaart, einfächerig, nur einsamig.

Astragalus sericopetalus Trautv. in Trudy Imp. S.-Petersburgksk. Bot. Sada 9: 448. 1884.
Lectotypus: Kizil Arwat, *Becker* (LE!; Iso: BM!, G!, K!,).

Pflanzen 25-45 cm hoch, mit 0,3-2 mm langen, dünnen, weißen Haaren bedeckt. Erdstock kräftig, bis 2 cm dick, mehrköpfig. Stengel einzeln oder zu wenigen, aufrecht, 15-35 cm lang, kantig gefurcht, sehr dicht mit wirr abstehenden Haaren bedeckt, fast filzig behaart. Nebenblätter weißhäutig, 10-15 mm lang, schmaldreieckig zugespitzt, schräg am Stengel angeheftet, vom Blattstiel frei, auf der Außenseite dicht wirr abstehend behaart. Blätter 10-25 cm lang; Blattstiel 1-5 cm lang, wie die Rhachis sehr dicht mit kurzen, wirr abstehenden Haaren bedeckt, verhärtend und teilweise überdauernd. Blättchen in 20-28 Paaren, 5-14 mm lang und 3-8 mm breit, elliptisch bis verkehrteiförmig, vorne gerundet bis schwach ausgerandet, oberseits kahl, unterseits spärlich bis locker, besonders am Rand und auf den Nerven fast abstehend behaart, häufig zusammengefaltet. Blütenstände in den Achseln der oberen Blätter sitzend, fast kugelig, dicht 4-12 blütig, dicht stehend und einen ährigen Gesamtblütenstand bildend. Brakteen weißhäutig, 5-7 mm lang, linealisch, spitz, behaart. Blütenstiele sehr kurz, bis 1 mm lang, behaart. Brakteolen linealisch, 3-6 mm lang, behaart, am

Grunde des Kelches ansitzend. Kelch zur Blütezeit röhrig bis schwach bauchig, 13-15 mm lang, dicht wirr abstehend behaart; Zähne ungleich, 4-6 mm lang, pfriemlich. Fruchtkelch stark aufgeblasen kugelig, 20-25 mm lang, weißlich-dünnhäutig, fein netzartig genervt; Zähne bis 10 mm lang. Krone gelb, behaart, bis zur Fruchtreife erhalten bleibend. Fahne 22-26 mm lang; Platte verkehrteiförmig, 9-11 mm breit, vorne schwach ausgerandet, am Grunde keilig in den kurzen Nagel verschmälert, oberseits auf der ganzen Fläche dicht seidig anliegend behaart. Flügel so lang wie die Fahne; Platte schmallänglich, vorne gerundet, 9-11 mm lang und 3-4 mm breit, außen entlang des unteren Randes dicht behaart; Öhrchen ca. 1 mm lang, Nagel 13-15 mm lang. Schiffchen 20-24 mm lang; Platte schiefelliptisch-gebogen, mit breit gebogener Unterkante und konkaver Oberkante, vorne gerundet bis spitzlich, 8-9 mm lang und 3-4 mm tief, außen entlang des unteren Randes dicht behaart; Öhrchen sehr breit, ca. 1 mm lang, Nagel 12-13 mm lang. Staubfadenröhre stufig abgeschnitten. Fruchtknoten sitzend, dicht behaart; Griffel dünn, bis über die Mitte hinauf behaart. Frucht im Fruchtkelch sitzend, eingeschlossen bleibend, schiefelliptisch, seitlich zusammengedrückt, 8-9 mm lang, ca. 5 mm hoch und ca. 2,5 mm breit, an der Bauchseite scharf gekielt, am Rücken sehr schmal gerundet, vorne mit einem aufgesetzten, schiefen, 1-3 mm langen Schnabel; Klappen kaum gewölbt, dünn, zäh, bräunlich, sehr dicht seidig, fast anliegend behaart. Hülse sich an der Bauchseite öffnend, einfächerig. Samen einzeln in der Hülse, ca. 5 mm lang und 3,5 mm breit, rötlichbraun, grubig-punktiert, matt.

Blütezeit: V-VI (-VII). **Vorkommen:** Montane Steppen.
Verbreitung: Turkmenstan: Kopet Dagh.

Gesehene Belege:

Turkmenistan. Prov. Krasnowodsk: Kisil Arwat, Achal-Tekke, 1883, *Becker* (BM, G, K, LE) - Kisil-Arwat, in monte Kopet Dagh, 14.5.1901, *Sintenis 1710* (FI, LD, LE) - 5 km S Kizyl-Arvat, 25.5.1952, *Rodin & al. 3433* (LE)- zwischen Kizyl-Arvat und Stat. Kamyschly, 11.5.1916, *Fedtschenko 13* (LE) - Fuß des Berges Sjunt unweit Kara Kala, 3.6.1931, *Popov 1480* (LE) - in monte Sundsodagh [= Sjunt], VI.1901, *Sintenis 1809* (LD, LE, M, W, WU) - Reg. Kara-Kala, Tokh-agatsch, 12.7.1931, *Borissova 336* (LE) - Distr. Kara-Kala, pr. pag. Chukur, declivia Sinn Chosar-dag, 800-1100 m, 17.9.1970, *Vasák* (M, W) - Distr. Ashkhabad, zwischen Nukhuroly und dem Tal Aidere, 29.5.1912, *Michelson 3825* (LE) - Tal Nukhur, 29.5.1912, *Samokisch 3790* (LE) - Nukhur-Gegend, Karaul, 1300 m, 22.6.1930, *Bobrov 397* (LE) - Prov. Ashkhabad: Reg. Bakharden, Bendesenskij pereval, 800 m, 15.6.1954, *Kaschtschenko* (LD, W) - Khrebet Koosly-Dag, Paß Bendesenskij, 15.6.1954, *Markova* (LE) - Reg. Bakharden, Utsch-Tug, 20.5.1963, *Timoschenko* (LE) - Reg. Bakharden, Berge "Mjazi Taplany", 6.7.1931, *Borissova 409* (LE) - Germab, 31.5.1889, *Androssov* (LE). -- Nicht genau lokalisierbar: Kopet Dagh, Ak-bulak, 3.7.1926, *Czerniakowska 42* (LE) - Khodzha-kala-bami, 11.5.1886, *Radde 411* (LE) - Tal Kara-gle-de, Berge von Tutly-kaul bei Saivan, 14.7.1933, *Gnezdenlo* (LE) - Berge bei Saivan, 6.6.1966, *Aschirova & al.* (LE).

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Eine neue Ononis-Art (Leguminosae) aus Nordafrika

von

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Abstract

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A new species of the genus *Ononis* from North Africa is decribed and illustrated.

Marokko gehört zu denjenigen Ländern, die bis heute in Bezug auf ihre Flora noch unzureichend erforscht sind und für die noch keine modernen zusammenfassenden Bestimmungswerke vorliegen. Somit ist es nicht weiter verwunderlich, daß immer wieder neue Pflanzenarten gefunden werden. Vor allem aus bislang wenig besammelten Gebieten oder aus kritischen Pflanzengruppen, deren Arten häufig verwechselt oder mißinterpretiert werden, sind solche Neufunde zu erwarten. So tauchte unlängst bei Bestimmungsarbeiten an nordafrikanischem Herbarmaterial diverser Sammelreisen von PODLECH sowie PODLECH & FÖRTHER eine neue Art der Gattung *Ononis* auf, welche im westlichen Nordafrika einen Verbreitungsschwerpunkt besitzt und hier mit zahlreichen kritischen Formenkreisen vertreten ist. Diese soll als kleiner Beitrag zu einer besseren Kenntnis der Gattung *Ononis* hier vorgestellt werden.

Ononis tazaensis Förther & Podlech, spec. nova

Holotypus: Marokko, Prov. Taza: Parc National, 17 km S Taza an der Straße S 311, 980 m, 4°00' W - 34°08' N, 11.5.1989, *Podlech 46441* (Hb. PODL.; Iso: G, MPU, P, RAB, Hb. FÖRTHER).

Plantae suffruticosae, basi crebre et intricatim ramosae, 15-25 cm altae. Caules tenues, indumento glanduloso duplo obtecti: dense pilis brevissimis ad 0,1 mm longis et sparse pilis longioribus ad 0,3 mm longis, insuper pilis simplicibus mollibus ad 0,3 (-0,5) mm longis. Stipulae 5-11 mm longae, multi-nervosae, laxe ad dense pilis glanduligeris ad 0,3 mm longis obtectae, per 1/3 - 1/2 petiolo adnatae inter se liberae. Folia trifoliolata, superiores unifoliolata, petiolo pilis glanduligeris simplicibusque proviso. Foliola tenua, late elliptici-obovata, margine in parte apicali obtuse dentata, pilis glanduliferis tantum obtacta. Racemi partiales uniflori. Pedunculus in aristam 5-8,5 mm longam abeuns, sicut pedicellus indumento glanduligero duplo provisus. Calyx campanulatus, 7-9 mm longus, indumento glanduloso duplo tantum obtectus, dentibus anguste triangularibus, tubo 2,5-3 plo longioribus, trinerviis. Corolla dilute flava nervis tenuissimis violaceis. Vexillum 12,5-14 mm longum. Legumina pendula, lineari-

cylindrica, acuminata, 10,5-13 mm longa et 2,2-2,6 mm crassa, glandulosa. Semina 5-9, late reniformia, 1,1-1,4 mm longa, brunnea, dense tenuiter papillosa.

Pflanzen 15-30 cm hoch, hemikryptophytisch mit einem relativ dicken, verholzten, oft reich und intrikat verzweigten, mehrköpfigen Grundstock. Stengel ± dicht beblättert, Internodien 3-23 mm lang, dicht mit sehr kurzen, feinen, 0,05-0,1 mm langen und mit deutlich wenigeren, etwas längeren, bis 0,3 mm langen, nicht klebenden Drüsenhaaren besetzt, daneben locker bis ± dicht mit sehr dünnen, weichen, bis 0,3 [- 0,5] mm langen Gliederhaaren bedeckt. Nebenblätter 5-11 mm lang, vielnervig, locker bis mäßig dicht mit bis 0,3 mm langen Drüsenhaaren bedeckt, auf $^1/_3$ bis $^1/_2$ der Länge mit dem Blattstiel verbunden, nicht hinter dem Stengel scheidig verwachsen; freie Nebenblattenden schmal dreieckig zugespitzt, ganzrandig. Blätter 9-23 mm lang, mit 3 Blättchen (dann Endblättchen bis 2 mm gestielt), im Infloreszenzbereich nur mit 1 Blättchen; Blattstiel 4,5-10 mm lang, mit Drüsen- und Gliederhaaren. Blättchen breit elliptisch-verkehrteiförmig bis elliptisch, 4,5-12 mm lang, 1,5-5,5 mm breit, ± mäßig dicht mit bis zu 0,3 mm langen Drüsenhaaren besetzt, die oberen $^2/_3$ des Randes ± deutlich stumpf gezähnt. Teilinfloreszenzen einblütig. Blütenstandsstiel 6,5-20 [-28] mm lang, mit doppeltem Drüsenhaarindument und gelegentlich vereinzelten Gliederhaaren, in eine 5-8,5 mm lange Granne endend. Blütenstiel 1,8-4,5 mm lang, wie der Blütenstandsstiel behaart. Kelch glockig, 7-9 mm lang, mit doppeltem Drüsenhaarindument (aber lockerer als an den Blütenstielen); Kelchzähne schmal dreieckig bis dreieckig, 2,5-3 mal so lang wie die Kelchröhre, dreinervig. Blütenkrone hellgelb bis gelb mit ± deutlicher, zart-violetter Fahnennervatur, vor der Anthese aufrecht, später nickend. Fahne breit elliptisch bis rundlich, 12,5-14 mm lang und 10-11,5 mm breit, nahezu ungenagelt. Flügel schmal verkehrt-eiförmig, 11-13 mm lang und 4-5,5 mm breit, basal einseitig mit einem ca. 1 mm langen Öhrchen und einem bis 3 mm langen Nagel. Schiffchen schief elliptisch-rhombisch, mit fast rechtwinkelig abgebogenem Schnabel, 14-16 mm lang und 4-5 mm breit, wie die Flügel genagelt. Ovar kurz gestielt, papillös. Hülsen hängend, linealisch zugespitzt und geschnäbelt, ± zylindrisch, wenig zusammengedrückt, 10,5-13 mm lang und 2,2 - 2,6 mm breit, mäßig dicht bis dicht mit 0,1-0,3 mm langen Drüsenhaaren bedeckt. Samen ca. 5-9 pro Hülse, herz- bis nierenförmig, 1,1-1,4 mm lang und 1,0-1,3 mm breit, braun, mit dicht feinhöckeriger Oberfläche.

Blütezeit: IV-V. **Vorkommen:** Felsspalten, steinige Böden, Schutthalden, 900-1700 m.
Verbreitung: Marokko (Mittlerer Atlas), Algerien (Djurdjura).

Gesehene Belege:

Marokko. Prov. Fès: Moyen Atlas, Imouzzer-du-Kandar - Ifrane, 1650 m, auf Kalk, 29.5.-9.6.1983, *Polatschek* (W). -- Prov. Taza: Parc National, 17 km S Taza an der Straße S 311, 980 m, Felsen, 11.5.1989, *Podlech 46441* (G, MPU, P, RAB, Hb. PODL., Hb. FÖRTHER) - In Atlantis Medii supra urbem Taza, 1300 m, 24.6.1925, *Maire* (G) - Près du col de Tizi n'Tiskine sur Taffert, 33°42' N - 4°15'W, 1560-1600 m, 13.6.1980, *Charpin, Jacquemoud & Jeanmonod Nr. Mar. 922* (G) - Mittlerer Atlas, ca. 19 km E Taffert an der Straße von Ahermoumou (Ribat-el-Kheyr) zum J. Bou Iblane (4803), 1680 m, 4°12' W - 33°39' E, 25.6.1989, *Podlech 47001* (Hb. PODL., Hb. FÖRTHER).

Algerien. Wil. Tizi-Ouzou: Djurdjura, pentes N de l'Azrou - Tirourda, 1600 m, 21.7.1939, *Dubuis* (Hb. PODL.).

Anmerkung:

Ononis tazaensis ähnelt am ehehsten der *O. natrix* L. und insbesondere deren subsp. *prostrata* (Braun-Bl. & Wilczek)Sirj., unterscheidet sich jedoch vor allem durch den dicken,

verholzten, reich und intrikat verzweigten Erdstock, die flachen und relativ dünnen Blättchen und die Art des Induments. Die Drüsenhaare sind kürzer und viel feiner als bei allen Formen der *O. natrix*, die Gliederhaare, soweit vorhanden, bedeutend kürzer als bei der subsp. *prostrata*. Die Hülsen tragen nur Drüsenhaare. Auch das weit nach Norden vorgeschobene, isolierte Areal spricht für die Eigen-ständigkeit der neuen Sippe. Die ähnliche *O. antennata* Pomel und insbesondere ihre subsp. *natricoides* Sirj. unterscheidet sich sofort durch den anuellen Wuchs mit wenigen aufrechten Stengeln.

Anschrift der Verfasser:
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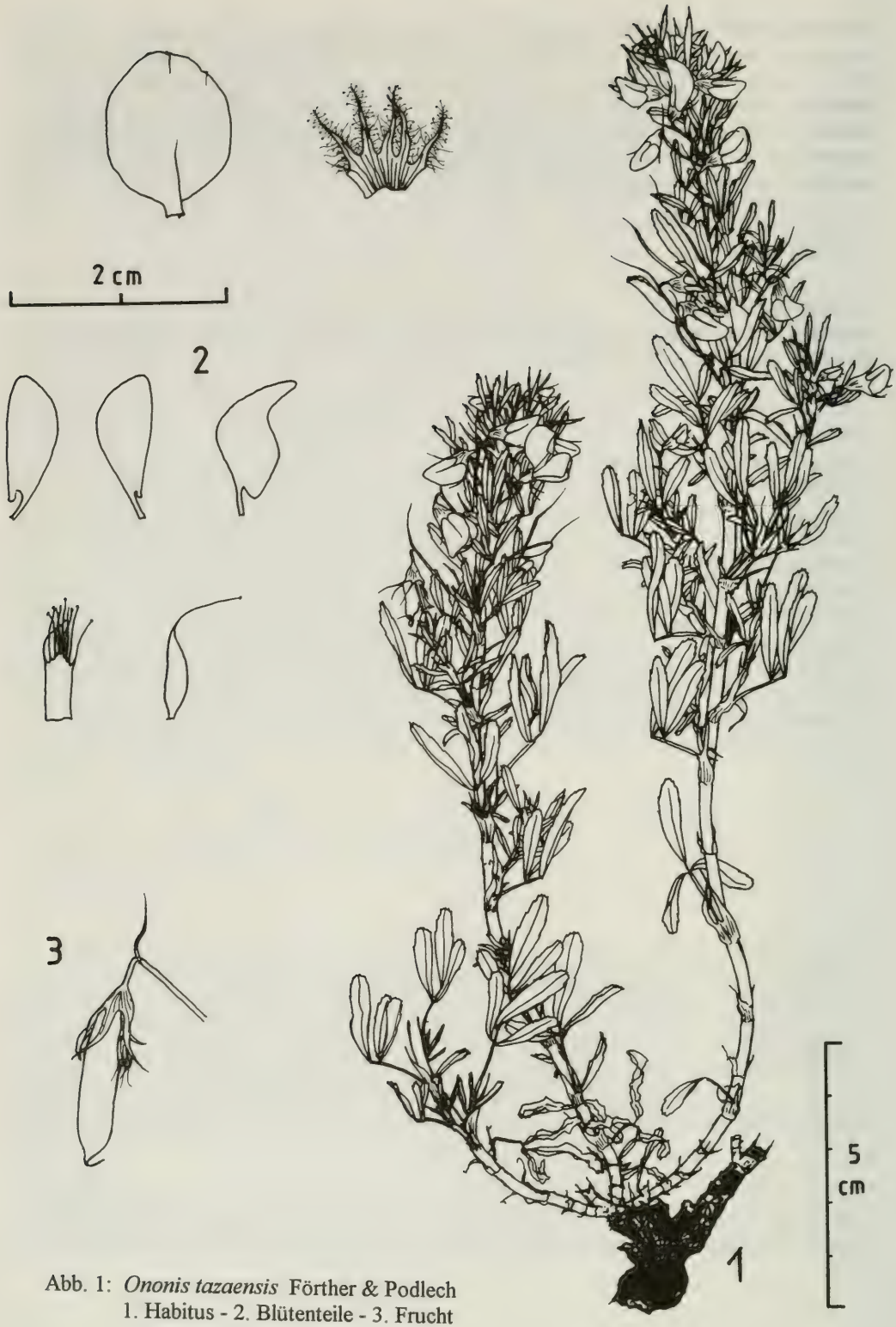

Abb. 1: *Ononis tazaensis* Förther & Podlech
1. Habitus - 2. Blütenteile - 3. Frucht

Revision of Astragalus L. sect. Sesamei DC. (Leguminosae)

by

M. GAZER

Abstract

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The present study deals with a systematic revision of *Astragalus* L. sect. *Sesamei* DC. This group of annual species is widely distributed in the dry regions around the Mediterranean Sea from Portugal to Turkey and from the Canary Islands through North Africa to Saudi Arabia, up to Pakistan and Middle Asia. The section contains 22 species and one subspecies, of which *A. pseudosinaicus* and *A. coronilla* subsp. *semnanica* are described as new.

These studies are based mainly on herbarium specimens from a large number of herbaria in all the world and in addition on the extensive herbarium of Prof. Podlech, Munich. In all nearly 2500 specimens were studied.

Complete synonymy, descriptions, geographical distribution and an enumaration of all studied material is given for each species. Identification keys for flowering and for fruiting specimens are provided.

Nearly all species within this group are closely related and were therefore much confused in earlier times.The complicate structure of the North African species, described mostly by POMEL in the last century, could be elucidated by thorough investigation of all the type specimens.

One of the reasons for the intricate taxonomic structure is surely the autogamy of all these annual plants. Comparative morphology, ecology and distribution are the main characters for defining species.

Several nomenclatural changes had to be done based on the study of the type specimens.

1. Introduction

1.1. Scope of the work

In several new floras, mainly of countries in Asia the genus *Astragalus* was treated including the annual species. In North Africa, where a great number of annual *Astragali* are concentrated, the genus was never investigated carefully in the past. A lot of new names and combinations without scientific value have been created up to this time. In course of the work on *Astragalus* done by PODLECH, Munich and his group, the annual species of the genus have also been investigated recently. In this group the section *Sesamei* DC. is one of the largest sections which is widespread from Western Europe and the Canary Islands to Middle Asia and Pakistan. Within the framework of a revision of all annual *Astragalus* species I had to clarify this special section as the practical part of my thesis.

1.2. Material and Methods

This study is mainly based on herbarium material of which ca. 2000 sheets have been examined. The material was borrowed from the following herbaria (acronyms according to HOLMGREN & al. [1990]): B, BC, BM, CAI, E. G., G-BOIS, HUJ, JACA, K, LE, M, MA, MPU, P, PR, RIY, TARI, W, WU. In addition also the private herbaria of S.-W. BRECKLE, Bielefeld (Hb. BRECKLE), H. FÖRTHER, München (Hb. FÖRTHER) and D. PODLECH, München (Hb. PODL.) as well as the Herbarium of the Suez Canal University, Ismailia, Egypt could be studied. I wish to express my best thanks to the authorities of the herbaria mentioned as well as to Prof. BRECKLE, Mr. FÖRTHER and Prof. PODLECH for loaning their valuable material to me for examination.

In addition many of the treated species were also studied in the field mainly in respect of flower color and the kind of growth. Some excursions in Egypt, mainly in the Siani Peninsula gave me a good idea about the conditions under which annual *Astragali* can grow. Personal communication by Prof. PODLECH of many data in this respect and also of soil and ecological conditions was a great help for me.

Since the work of PODLECH (1988) on *Astragalus* sect. *Caprini* it is evident that the kind of indumentum is a very valuable taxonomic character within the genus *Astragalus*. Therefore the kind and the length of hairs have been studied in all parts of the plants with the aid of a good dissecting microscope.

The length and shape of flower parts are also of some importance for delimitation of *Astragalus* species. Therefore flower dissections have been made in most cases. The boiled flowers have been dissected and the parts have been fixed between two pieces of "Astralon-Folie", an elastic and transparent foil, glued together at the margins by an organic adhesive. These flower preparations which show all essential characters of the flower parts were in all cases permanently added to the herbarium sheets to which they belong.

1.3. Acknowledgements

I wish to express my great thanks and gratitude to Prof. Dr. D. PODLECH for suggesting the scope of this work and for supervising its progress. I am highly indebted to Prof. PODLECH for his continuos encouragement and for providing all the necessary facilities during my research. To Prof. Dr. J. GRAU, head of the Institute of Systematic Botany I wish to express my deepest thanks for allowing me to work in this place.

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2. General Part

2.1. Historical Review

The genus *Astragalus* was known in the Linnean time by several species of which two belong to the section *Sesamei,* which is treated in this work. TOURNEFORT has described an annual one in 1700 as "Stella leguminosa" which was validated by GOUAN as *Astragalus stella* in 1773. Another annual species was described by LINNE in 1753 as *Astragalus sesameus* which was later selected as the lectotype of the Section *Sesamei* DC.

In 1800 PALLAS presented the first monograph of the genus *Astragalus* comprising 116 species including the two annual species mentioned above. Nearly at the same time A. P. DECANDOLLE (1802) also published a monograph of the genus *Astragalus* and related genera but he did not add any more species to the group treated later as Section *Sesamei* by A. P. DECANDOLLE (1825). In 1813 DELILE described *A. tribuloides* as a species indigenous in Egypt.

Between 1842 and 1859 several new species, mostly from the Orient were added by BOISSIER, e.g. *A. persepolitanus, A. sinaicus, A. sesamoides, A. minutus, A. erpocaulos* and *A. ammocryptus*. The last three species were later put into the synonymy of the variable species *A. tribuloides* Del. or were reduced to varietal rank under this species. In Middle Asian Russia KARELIN & KIRILOV found *A. ammophilus* and *A. filicaulis* as new whereas LEDEBOUR described *A. asterias*.

A new step in our knowledge of the genus *Astragalus* was the famous work of BUNGE (1868/1869) entitled "Generis Astragali Species Gerontogeae" in which he treated no less than 971 species of Old World *Astragalus* species. He divided the genus in 8 subgenera and 105 sections. Nearly all annual species were put into the subgenus *Trimeniaeus* which contained 15 sections. Unfortunately he did not recognize the sections which were established earlier by DECANDOLLE (1825), so that several section names had to be changed. All species now treated within section *Sesamei* DC. were put by BUNGE in his heterogeneous section *Oxyglottis*. BUNGE added several species to our section, e.g. *A. triradiatus, A. pseudostella, A. coronilla, A. biovulatus, A. gryphus*. Some of these are not good species and had to be put into synonymy. In North Africa botanists like POMEL (1874) and MAIRE (in the first half of this century) described a lot of species and infraspecific taxa within our group. Most of them are synonyms of other species.

In 1944 SIRJAEV published a "Conspectus praecursorius specierum subgen. *Trimeniaeus* Bunge generis *Astragali* L.". This was indeed a preliminary survey because most of the sectional division and also the delimitation of several species had to be changed.

GONTSCHAROV et al. in the treatment of the genus *Astragalus* in the monumental Flora U.S.S.R (vol. 12, 1946) has maintained the subgenus *Trimeniaeus* Bunge and gave a perfect survey about the 10 Russian species of the section, which he named erroneously sect. *Oxyglottis*.

EIG has made monographic studies within the genus *Astragalus* which have been published after his death as "Systematic studies on the Astragali of the Near East" (1955). As some of his decisions were not worked out well up to his death, this treatment is not very helpful and his new species *A. rene-mairei* and *A. faktorovskyi* are now in the synonymy of other species.

In our times several new floras mainly in the oriental countries were edited in which the genus *Astragalus* and species of the sect. *Sesamei* were treated, like "Flora of Iraq", "Flora of Turkey", "Flora of Palestine", "Flora of Libya" and some Floras of Middle Asia. PODLECH (1991) gave a new classification of the annual *Astragali* dividing the sect. *Oxyglottis* Bunge into sect. *Sesamei* DC. and sect. *Oxyglottis* in a narrow sense.

2.2. The position of the section *Sesamei* DC. within the genus and especially within its annual groups

In the classical system of the genus *Astragalus* created by BUNGE (1868/69) most of the annual species were put into a subgenus by its own, *Trimeniaeus* Bunge which was divided into 15 sections. Only the species with a barbulate stigma were put into the subgenus *Pogonophace* Bunge forming the two sections *Heterodontus* Bunge and *Sesbanella* Bunge. As this character is no longer considered as important and on the other hand the two sections are in all other respect very near to the members of the subgenus *Trimeniaeus,* this classification is not uphold in our time. The work of PODLECH on the annual *Astragali* (1991) has shown that most of these species form a nearly coherent group of plants in which the sections are separated and delimited in quite another way than by BUNGE. New characters concerning the stipules, the indumentum and the shape of the fruit have given a new idea of this interesting group. Most of the annuals are now considered to be a very old group of the genus which has evolved since long time mainly in the desertic regions of the Old World. Within this group the section *Sesamei* DC. is very near to the section *Annulares* DC. These two sections represent rather basic groups because they do not show any specialties neither in indumentum nor in fruit characters. Sect. *Sesamei* DC. can be distinguished from section *Annulares* DC. by the capitate inflorescences and by the fruits which are mostly dilated at the base.

3. Special part

Astragalus L. sect. Sesamei DC., Prodr. 2: 287. 1825. **Lectotype:** *Astragalus sesameus* L. (PODLECH in Mitt. Bot. Staatss. München 29: 488. 1990).

= *Astragalus* sect. *Onycholobium* Pomel in Bull. Soc. Sci. Phys. Algérie 11: 189. 1874. **Lectotype:** *Astragalus sesameus* L. (PODLECH in Mitt. Bot. Staatss. München 29: 483. 1990).

-- *Astragalus* sect. *Oxyglottis* Bunge in Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 10. 1868 pro parte (with exclusion of the type).

3.1. General characters of sect. Sesamei DC.

Plants annual, mostly with a ± well developed stem, vested with basifixed predominantly white or mixed white and black hairs at the stipules and in the inflorescences. Stem erect or prostrate, branched at the base. Stipules greenish or whitish, triangular lanceolate to triangular, acuminate, adnate to the base of the petiole, otherwise free or connected behind the stem forming a short sheeth around the stem. Leaves imparipennate, sessile or pedunculate. Inflorescences distributed mostly along the whole length of the stem, sessile or pedunculate, with (1-) 2-12 ore more nearly sessile flowers in a rather dense head. Bracts membraneous, narrowly triangular. Calyx campanulate or rarely shortly tubular, hairy, with teeth shorter to longer than the tube. Corolla purple, light violet or yellowish. Standard 4-13 (-20) mm long, narrowly elliptic to oblong or rhombic-ovoid. Wings obtuse or emarginate at the apex. Keel shorter than the wings, triangular-obovate with ± acute apex. Staminal tube straightly cutted or ending in a curved line. Ovary sessile, ovate-oblong, hairy; style 1-2 mm long, glabrous. Legumes ± sessile, erect or spreading, linear-oblong to oblong-ovoid, straight or slightly curved upwards, rounded and very ofte dilated at the base or ± distinctly bigibbous, completely bilocular or rarely semibilocular (only in *A. filicaulis*).

3.2. Special description of section *Sesamei* DC.

Plant stature. Plants annual, with tiny roots, simple or branched at the base.

Indumentum. Hairs always basifixed, mostly soft or ± rigid, predominantly white with black hairs present mostly at the nodes, stipules and in the inflorescences, rarely merely white (e.g. in *A. pseudosinaicus*). The length of hairs varies from 0,05 to 2,4 mm, they can be appressed, semipatent or patent. In the legumes we can find often a double indumentum consisting of very short (up to 0,2 mm) mostly adpressed and of distinctly longer hairs (1 mm or more), adpressed to patent, often sitting on little tubercles.

Stems. Stems are erect or more often prostrate to ascending, up to 45 cm long in good conditions, sometimes nearly absent (so often in *A. sesameus*, *A. tribuloides*, but occasionally in nearly all species), green or yellowish, in few cases reddish (e.g. in *A. coronilla*, *A. persepolitana*), sulcate or finely striate, nearly always hairy, sometimes with very short adpressed hairs, either sparsely (e.g. *A. kerkukiensis, A. persepolitanus*) or densely (e.g. *A. asterias*) hairy or with patent hairs (e.g. *A. coronilla* subsp. *coronilla*). The density of the hairs nearly always increases towards the nodes and the stipules.

Stipules. Stipules are greenish or whitish with sometimes a green apex, more rarely hyalin (e.g. *A. biovulatus* Bunge), narrowly triangular to triangular, acuminate, erect, 1-4 mm long, adnate to the base of the petiole, otherwise free or connate behind the stem forming a short sheeth around the stem (e.g. *A. pseudosinaicus* Gazer & Podlech, *A. sinaicus* Boiss.), covered with white and in most cases also with some black hairs.

Leaves. Leaves 2-11 or up to 16 cm long (e.g. *A. kerkukiensis* Bornm.), imparipinnate, with a short petiole 0,8-2,5 cm or rarely up to 6 cm long (in *A. kerkukiensis* Bornm.) or sessile, in this case the petiole shorter than the distance between two leaflets (e.g. *A. asterias* Hohen.), pilose like the rachis. Leaflets opposite in 2-12 pairs, 2-4 pairs e.g. in *A. cornubovis* Lipsky, 6-12 pairs e.g. in *A. stella* Gouan. The length of leaflets is between 2 and 18 mm, the width between 1-4,5 mm. The shape of the leaflets varies from narrowly elliptic to elliptic, obovate or cuneate-obovate with acute, rounded or emarginate apex. Leaflets are always hairy with white hairs (also black hairs e.g. in *A. sinaicus* Boiss.) on both sides or glabrous on the upper side. In *A. coronilla* Bunge and *A. persepolitanus* Bunge we can find both plants with leaflets glabrous on the upper side and plants with very few hairs towards the margins. These are keyed under "glabrous" and "hairy" in the keys.

Inflorescences. The inflorescences are mostly distributed in the leaf axils along the whole stem or only in the axils of the upper leaves (e.g. *A. gryphus* Bunge). They are nearly sessile (e.g. *A. sesameus* L., *A. tribuloides* Del.) or more or less long pedunculate (up to 12 cm long in *A. stella* Gouan). Sometimes the lower inflorescences are nearly sessile and the upper ones distinctly pedunculate. The number of flowers in one inflorescence is either low (1-4 in *A. gryphus* Bunge, *A. scorpioides* Willd.) or up to 15 (in *A. stella* Gouan). They are nearly sessile and arranged in a compact head. Bracts are always short, 1-2,5 mm long, hairy and of the same texture as the stipules. Bracteoles always absent.

Calyx. Calyx is mostly campanulate or more rarely tubular (e.g. in *A. schimperi* Boiss.), mostly 2,5-4 mm long (ca. 2 mm long in *A. biovulatus* Bunge). It varies greatly in the tube / teeth ratio. The teeth are subulate and much shorter than the tube up to much longer than the tube. The calyx is mostly covered with white and black hairs, the latter very often increasing in number toward the teeth, pure white hairs can be found e.g. in *A. pseudosinaicus* Gazer & Podlech.

Corolla. The corolla is always glabrous and varies widely in colour. In most species if one considers enough material, the colour of the corolla is not fixed and can be either violet, purplish or yellowish to whitish. So it is not of great value for taxonomic purposes. The colour is only identifiable in fresh material. Old and dried material often shows an indifferent brownish

colour or ist straw-coloured.

Standard. It is always longer than the calyx. The shape varies from narrowly oblong or narrowly elliptic to somewhat rhombic or obovate. The length varies from 4-12 mm, only in some forms of *A. tribuloides* Del. it can reach 20 mm in length. The limb is narrowed at the base into an indistinct or ± long claw.

Wings. The wings are always shorter than the standard. They consists of a narrowly oblong limb, rounded or emarginate at the apex, provided with an auricle 0,5-1 mm long at the base and a tiny claw.

Keel. The keel consists of two petals which are connate along the lower edges of the limb. It is shorter than the wing petals. The limb is obliquely triangular-obovate, with the lower edge broadly bent in the apical part and the upper edge straight or sligtly convex, with a rather acute apex and an indistinct auricle at the base. The rather slender free claws are somewhat shorter to equaling the limb.

Staminal tube. It is cut at the end in a straight line at a rectangular angle or is ending in a rounded to triangular line.

Ovary. Sessile or subsessile, hairy or glabrous; style short, glabrous.

Pod. Sessile, erect (e.g. *A. sesameus* L., *A. gryphus* Boiss.) or star-like arranged (e.g. *A. stella* Gouan), ovoid (*A. biovulatus* Bunge), narrowly oblong-ovate (in most species) or linear (*A. scorpioides* Willd.), straight or slightly curved towards the ventral side, slightly to distinctly widened towards the base and rounded or slightly to distinctly (e.g. *A. tribuloides* Del.) bigibbous, acuminate into a short straight or 1-2 mm long curved or hooked beak, 5-22 mm long, only in *A. scorpioides* Willd. up to 50 mm long. All species are carinate or weakly keeled on the ventral side and deeply V-like grooved on the dorsal side. The valves are glabrous or mostly hairy with either a simple indumentum of appressed (e.g. *A. asterias* Hohen.) or patent hairs (e.g. *A. coronilla* Bunge subsp. *coronilla*) or with a double indumentum of very short, appressed to semiappressed hairs (0,05-0,2 mm long as a rule) and much longer, up to 2,3 mm long (in *A. stella* Gouan) hairs which are ± appressed or more often semi-patent or patent and often inserted in little tubercles. These are colourless or rarely brownish coloured (in *A. tadmorensis* Eig & Samuelsson). Pods are opening at the ventral suture or sometimes additionally along the dorsal line, with a narrow septum but completely bilocular because of the deeply intruded dorsal groove; only in *A. filicaulis* Kar. & Kir. the pods are semibilocular.

Seeds. Seeds 1-12 in each locule, ear- or kidney-shaped, 1-3,5 mm long and 1-2,5 mm broad (only in *A. schimperi* Boiss. globular), all glabrous, brownish or yellowish.

3.3. Cytology and breeding behavior

In contrast to the New World *Astragali* all species in the Old World are characterized by chromosome numbers based on x = 8 chromosomes.

Chromosome numbers of the following species out of our section have been counted according to the several published indices. All species are diploid with the exception of *A. scorpioides* Willd. which is hexaploid with 2n = 48 chromosomes. This highly polyploid level illustrates the somewhat isolated position of this species within the section.

A. filicaulis Kar. & Kir.	2n = 16	(FEDOROV)
	2n = 16	(TAKHTAJAN)
as *A. rytilobus* Bunge	2n = 16 + 2 B	(MOORE 1973)
A. schimperi Boiss.	2n = 16	(FEDOROV)
	2n = 16	(MAASSOUMI)
A. scorpioides Willd.	2n = 48	(FEDOROV)
A. sesameus L.	2n = 16	(FEDOROV)

A.

	2n = 16 (MOORE 1977)
	2n = 16 (GOLDBLATT 1981)
	2n = 16 (GOLDBLATT 1984)
A. A. sesamoides Boiss.	2n = 16 (FEDOROV)
	2n = 16 (MAASSOUMI)
A. stella Gouan	2n = 16 (MOORE 1977)
	2n = 16 (GOLDBLATT 1984)
A. tribuloides Del.	2n = 16 (FEDOROV)
	2n = 16 (GOLDBLATT 1981)
	2n = 16 (TAKHTAJAN)
	2n = 16 (MAASSOUMI)

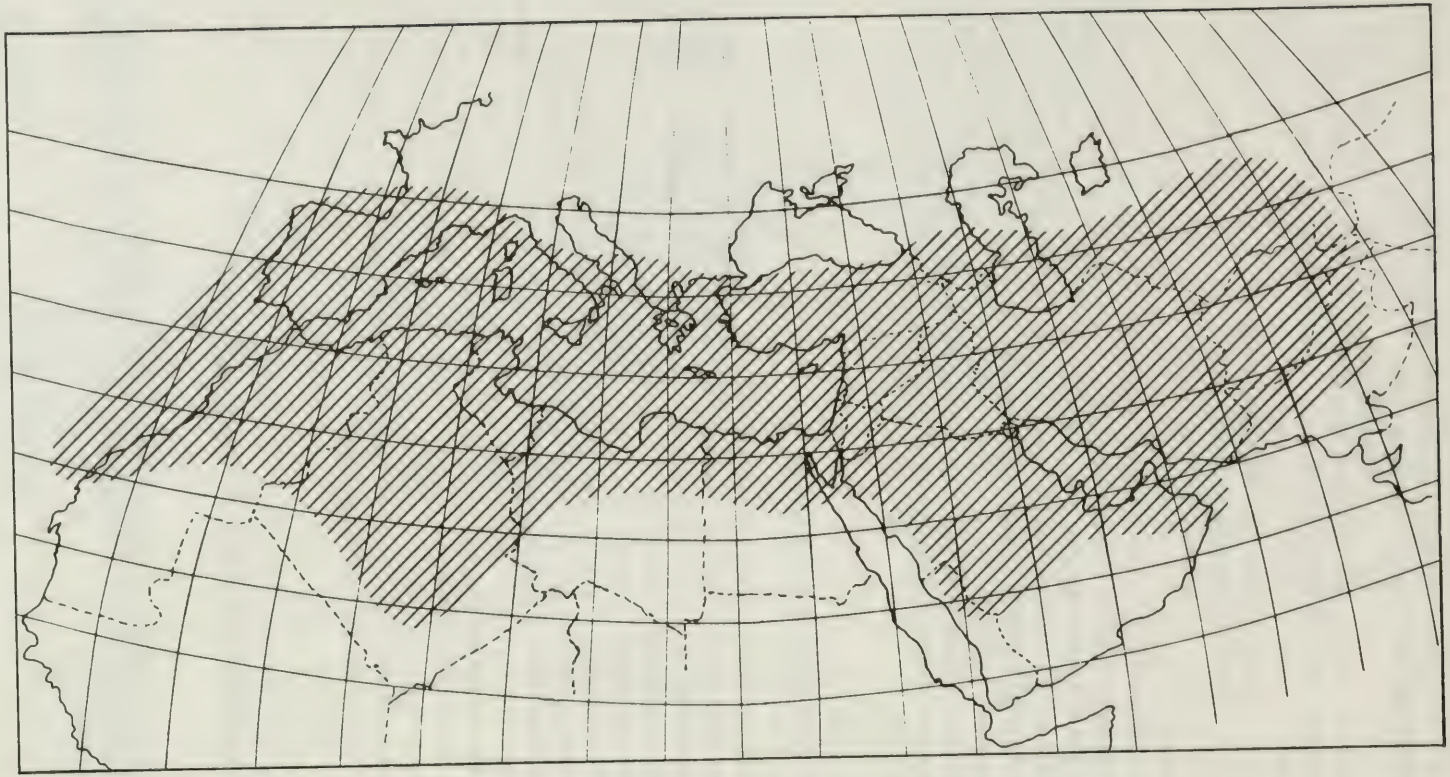
According to field studies of the minute flowers and the fact that already in the bud stage the pollen is spread out of the anthers all around the stigma it is supposed that all our species as well as most of the *Astragalus* species are autogamic. This would explain the fact that some variable characters as the colour of the flowers are quite uniform within one population, but may be different in other adjacent populations. Thus some widespread and variable species like *A. stella* Gouan may be divided into numerous slightly different populations. Nevertheöess these differences can not be used for separating such populations at any taxonomic rank. So it is not astonishing that hybrids were never recognized neither in our section nor in most other groups of the genus.

3.4. Distribution and Ecology of the Section

Like most of the annual species of the genus *Astragalus* the species of sect. *Sesamei* also inhabit the dry regions of the Northern Hemisphere in the Old World. Some species prefer mediterranean climate and have their northern limit in the countries of Southern Europe. Others are true desert plants like *A. tribuloides* Del. or *A. pseudosinaicus* Gazer & Podlech which are limited within true semidesert or desert areas. The section as a whole is distributed from the Canary Islands, Morocco and Portugal in the West to Middle Asia and Pakistan in the East (see map 1). Some species have a rather wide distribution like *A. stella, A. tribuloides* or *A. asterias*, whereas others have a very restricted area like *A. tadmorensis* or *A. transjordanicus*. The reasons for such restricted areas of annual plants are not well understood. PODLECH (1991) believes that all the annual species of the genus *Astragalus* form an old group so that these restricted areas would represent the rest of a much wider area in former times. All the species are confined to open vegetation types. So they can be found in ruderal places, along roadsides, in open sandy flats, as a weed in fields, also in higher regions between stones and gravel. Some of the species are also moderately salt tolerant.

3.5. Division of the Section into several Groups of Species

The section *Sesamei* seems to be rather uniform but nevertheless it can be divided into several groups of species which are obviously more or less closely related and to which can be added some isolated species.



Map 1. Distribution of *Astragalus* sect. *Sesamei*

Astragalus asterias - group: *A. asterias; A. geniculatus; A. longicaulis; A. tadmorensis.* The species of this group have sessile leaves and fruits with a double indumentum.

Astragalus filicaulis. This species is rather isolated because of the really semibilocular fruits with a rather thin, rugose wall which are at least partially reflexed.

Astragalus gryphus. This is the only species within the section where the fruit has no septum but is nevertheless fully bilocular because of the deeply intruded dorsal groove.

Astragalus persepolitanus - group: *A. biovulatus; A. cornubovis; A. coronilla; A. kerkukiensis; A. persepolitanus.* The species of this group have leaflets which are glabrous or mostly glabrous on the upper side and small ovoid to ovoid-acuminate legumes with a simple indumentum and hairs never inserted in tubercles.

Astragalus schimperi. It comes very near to the *Astragalus stella* - group but is the only species within the section and within all annual *Astragali* which has globular seeds.

Astragalus scorpioides. This species is somewhat isolated with only 1-2 (-3) flowers in the leaf axils and with linear, 30-50 mm long legumes.

Astragalus sesameus - group: *A. sesameus; A. sesamoides.* These two species have erect, narrow fruits with hairs never inserted in tubercles.

Astragalus sinaicus - group: *A. pseudosinaicus; A. saharae; A. sinaicus; A. triradiatus.* The stipules within this group are adnate to the petiole and connate on the opposite side forming a short but distinct sheath around the stem.

Astragalus stella - group: *A. stella; A. tribuloides.* These species have fruits which are star-like arranged with a double indumentum but hairs never with tubercles.

Astragalus transjordanicus. This species resembles the *A. asterias* - group but differs in having fruits with a simple indumentum.

3.6. List of species arranged according to the countries where they grow

FRANCE:
A. sesameus L.
A. stella Gouan

SPAIN:
A. scorpioides Willd.
A. sesameus L.
A. stella Gouan

ITALY:
A. sesameus L.

MALTA:
A. sesameus L.

YUGOSLAVIA:
A. sesameus L.

GREECE:
A. sesameus L.
A. sinaicus Boiss.

CANARY ISLANDS:
A. stella Gouan

MOROCCO:
A. geniculatus Desf.
A. gryphus Bunge
A. longicaulis Pomel
A. saharae POMEL
A. scorpioides Willd.
A. sesameus L.
A. stella Gouan

ALGERIA:
A. geniculatus Desf.
A. gryphus Bunge
A. longicaulis Pomel
A. pseudosinaicus Gazer & Podl.
A. saharae Pomel
A. scorpioides Willd.
A. sesameus L.
A. stella Gouan

TUNISIA:
A. geniculatus Desf.
A. longicaulis Pomel
A. pseudosinaicus Gazer & Podl.
A. saharae Pomel
A. sesameus L.
A. stella Gouan

LIBYA:
A. asterias Hohen.
A. longicaulis Pomel
A. saharae Pomel
A. stella Gouan

EGYPT:
A. asterias Hohen.
A. schimperi Boiss.
A. stella Gouan
A. tribuloides Del.

SAUDI ARABIA:
A. schimperi Boiss.
A. tribuloides Del.

ISRAEL:
A. asterias Hohen.
A. schimperi Boiss.
A. tribuloides Del.

JORDAN:
A. asterias Hohen.
A. schimperi Boiss.
A. tribuloides Del.

LEBANON:
A. asterias Hohen.
A. tribuloides Del.
A. triradiatus Bunge

SYRIA:
A. asterias Hohen.
A. kerkukiensis Bornm.
A. schimperi Boiss.
A. tadmorensis Eig
A. transjordanicus Samuels.
A. tribuloides Del.
A. triradiatus Bunge

IRAQ:
A. asterias Hohen.
A. kerkukiensis Bornm.
A. schimperi Boiss.
A. tribuloides Del
A. triradiatus Bunge

CYPRUS:
A. asterias Hohen.

TURKEY:
A. asterias Hohen.
A. sinaicus Boiss.
A. tribuloides Del.
A. triradiatus Bunge

ASIATIC RUSSIA:
A. asterias Hohen.
A. cornubovis Lipsky
A. filicaulis Kar. & Kir.
A. persepolitanus Boiss.
A. sesamoides Boiss.
A. tribuloides Del.

IRAN:
A. asterias Hohen.
A. biovulatus Bunge
A. coronilla Bunge subsp. *coronilla*
A. coronilla Bunge subsp. *semnanicus* Gazer & Podl.
A. cornubovis Lipsky
A. filicaulis Kar. & Kir.
A. kerkukiensis Bornm.
A. persepolitanus Boiss.
A. schimperi Boiss.
A. sesamoides Boiss.
A. tribuloides Del.

AFGHANISTAN:
A. asterias Hohen.
A. biovulatus Bunge
A. coronilla Bunge subsp. *coronilla*
A. filicaulis Kar. & Kir.
A. kerkukiensis Bornm.
A. persepolitanus Boiss.
A. sesamoides Boiss.
A. tribuloides Del.

PAKISTAN:
A. asterias Hohen.
A. filicaulis Kar. & Kir.

A. schimperi Boiss.
A. tribuloides Del.

3.7. Key to flowering plants

1 Leaflets glabrous on upper side (if sometimes very sparsely hairy see also 1-) 2
- Leaflets hairy on upper side 8
2 Hairs on stem and rachis at least in part patent 3
- All hairs on stem and rachis ± strongly adpressed; all hairs merely white 6
3 Calyx 6-8 mm long, its teeth distinctly longer than the tube; standard 9-11 mm long 14. *A. scorpioides*
- Calyx up to 3 mm long, its teeth shorter than the tube; standard up to 7 mm long 4
4 Hairs on stem and rachis 0,5-1,2 mm long; inflorescences sessile; calyx ca. 2 mm long; standard 3,4-4 mm long 2. *A. biovulatus*
- Hairs on stem and rachis up to 0,6 mm long; inflorescences with a peduncle 0,5-7 cm long; calyx 2,5-3 mm long 5
5 All hairs on the plant dense and patent, merely white 4a. *A. coronilla* subsp. *coronilla*
- Stem, lower side of leaflets and peduncles in part with adpressed hairs, in the i inflorescences with additional black hairs 10. *A. persepolitanus*
6 Inflorescences with a peduncle 0,5-7 cm long; limb of the wings obliquely emarginate; staminal tube straightly cutt 4b. *A. coronilla* subsp. *semnanicus*
- Inflorescences sessile or rarely with a peduncle up to 0,5 cm long; limb of the wings apically rounded; staminal tube ending in a curved line 7
7 Leaflets (3-) 4-7 paired; teeth of the calyx longer than the tube 8. *A. kerkukiensis*
- Leaflets (2-) 3-4 paired; teeth of the calyx ca. 1/2 the length of the tube 3. *A. cornubovis*
8 Stipules connate behind the stem into a ± distinct sheath 9
- Stipules free from each other 12
9 Whole plant only covered with white hairs; leaves sessile (no distinct petiole present); calyx teeth only slightly shorter than the tube 11. *A. pseudosinaicus*
- Black hairs always present at the nodes, stipules and in the inflorescences; leaves with a ± distinct petiole; calyx teeth up to half as long as the tube (the three following species are not always clearly distinguishable in flowering state !) 10
10 Standard 8-11 mm long; calyx teeth half as long as the tube 22. *A. triradiatus*
- Standard mostly shorter, up to 8 mm long; calyx teeth shorter 11
11 Stem and rachis with ± adpressed hairs 12. *A. saharae*
- Stem and rachis with ± patent hairs 17. *A. sinaicus*
12 Stem, petiole and rachis with strongly adpressed hairs 13
- Stem, petiole and rachis at least partly with semipatent to patent hairs 17
13 Hairs of the whole plant merely white, 0,2-0,5 mm long; stipules 2-2,5 mm long; leaflets on upper side very sparsely hairy or very often glabrous (see 6) 4b. *A. coronilla* subsp. *semnanicus*
- Black hairs always present at the stipules and in the inflorescences; hairs up to 1 mm or longer; stipules up to 4 (-4,5) mm long; leaflets on upper side distinctly hairy 14
14 Plant ± densely hairy; leaves sessile (without a distinct petiole); calyx teeth half as long as the tube 15
- Plant loosely hairy; leaves with a short but distinct petiole; calyx teeth only slightly shorter or as long as the tube 17
15 The species 1. *A. asterias* and 19. *A. tadmorensis* which should be keyed here are to be distinguish with certainty only in fruiting stage. As a rule *A. tadmorensis* has very small leaflets (2-4,5 mm long) which are rounded at the apex wheras *A. asterias* has

mostly longer but sometimes also very short leaflets, which are usually acute to subobtuse.

16 Calyx 3-4 mm long; bracts 1-1,5 mm long 5. *A. filicaulis*
- Calyx 5,5-7 mm long; bracts 2-3 mm long 15. *A. sesamoides*

17 Hairs of the plant at most up to 0,6 mm long; calyx 2,5-3 mm long; leaflets on upper side very sparsely hairy or often glabrous (see 5/5*) 18
- Hairs at least 1,1 mm long but mostly longer (up to 1,9 mm); calyx at least 4 mm long but mostly distinctly longer; leaflets on upper side loosely to densely hairy (only in 16. *A. sesameus* sparsely hairy) 20

18 All hairs on the plant patent and merely white 3a. *A. coronilla* subsp. *coronilla*
- Hairs on lower side of leaflets ± adpressed, at the stipules and in the inflorescences also with mixed black ones 10. *A. persepolitanus*

19 Leaves sessile (without a distinct petiole) 21
- Leaves with a ± distinct petiole 23

20 Hairs at the stem up to 1,5 mm long; limb of the wings deeply incised, nearly bilobe 6. *A. geniculatus*
- Hairs at the stem mostly up to 1 mm long; limb of the wings apically rounded 22

21 Stipules membranous, 1-2,5 mm long; hairs at the stem semipatent; leaflets 1,4-4 mm long; flowers 2-4 in a head; calyx tubular, 5-6 mm long 20. *A. transjordanicus*
- Stipules green, 2-4,5 mm long; hairs at the stem adpressed to semipatent; leaflets 3-11 mm long; flowers (3-) 5-11 in a head; calyx campanulate, 4-5 mm long 9. *A. longicaulis*

22 All inflorescences with a peduncle 2-11,5 cm long, with 4-15 flowers 18. *A. stella*
- At least the lower inflorescences in part sessile or with a very short peduncle, the upper with a peduncle at most up to 4,2 cm long, at most with up to 10 flowers 23

23 Whole plante densely white-silvery hairy; leaflets apically obtuse to acute, on both sides densely adpressed hairy 24
- Leaflets apically rounded or emarginate, on the upper side sparsely to loosely hairy, on the lower side more densely hairy 25

24 Upper inflorescences distinctly stalked with a peduncle up to 4,2 cm long; limb of the wings indistinctly emarginate 13. *A. schimperi*
- Upper inflorescences mostly sessile, if rarely stalked than peduncle never longer then 2,5 cm; limb of the wings apically ± deeply incised 21. *A. tribuloides*
(the last two species are not always easily to distinguish in flowering stage)

25 Leaflets on lower side with semipatent hairs; inflorescences all sessile or nearly sessile with (1-) 2-4 flowers; bracts 3-5 mm long; calyx teeth as long as the tube 7. *A. gryphus*
- Leaflets on lower side with adpressed hairs; inflorescences partly shortly stalked with a peduncle up to 0,5 cm long, with 3-10 flowers; bracts 1-3 mm long; calyx teeth distinctly shorter than the tube 14. *A. sesameus*

3.8. Key to fruiting plants

1 Legumes linear, erect, 30-50 mm long, 1-2 (-3) in each leaf axil 14. *A. scorpioides*
- Legumes not as above, much shorter 2

2 Leaflets on upper side glabrous (if sometimes scarcely hairy, see also 2*); legumes never with a double indumentum and never with hairs inserted in little tubercles 3
- All leaflets on upper side hairy 8

3 Stem and rachis with short, closely appressed hairs up to 0,7 mm long; all hairs on the plant merely white 4
- Stem and rachis at least in part with patent hairs 6
4 Infructescences with a 0,5-5 (-7) cm lang peduncle; legume narrowly ovate, 10-16 mm long, long acuminate, glabrous or appressed hairy
4b. *A. coronilla* subsp. *semnanicus*
- Infructescences sessile or mostly with a peduncle up to 0,5 cm long; legume of other kind 5
5 Legume asymmetrically ovate, acute, 6,5-7 mm long, glabrous or appressed hairy; 2 seeds in each locule 8. *A. kerkukiensis*
- Legume narrowly oblong, acute, 12-16 mm long, appressed hairy; ca. 5 seeds in each locule 3. *A. cornubovis*
6 Infructescences always sessile; legume ovate, 5-6 mm long, with a very short curved apex, with patent, 0,7-1 mm long hairs; 1 seed in each locule 2. *A. biovulatus*
- Infructescences with a 0,5-7 cm long peduncle (very rarely sessile); legume longer, with a short straight apex, covered with very short hairs up to 0,05 mm; at least 2 seeds in each locule 7
7 Legume narrowly ovate, 10-16 mm long, long acuminate, glabrous or patent hairy; 3-4 seeds in each locule hairs on the whole plant patent, merely white
4a. *A. coronilla* subsp. *coronilla*
- Legume ovate-triangular, 6-9 mm long, with a 0,7-1 mm long beak, glabrous or appressed hairy; 2 seeds in each locule; hairs at stipules and in the inflorescences partly black 10. *A. persepolitanus*
8 Stipules behind the stem connate into a ± distinct sheath; legumes always with a double indumentum 9
- Stipules free from each other 12
9 Plant only covered with pure white hairs. Leves sessile (without a distinct petiole); infructescences sessile or with a peduncle only up to 1 cm long; legume 10-12 mm long, covered with 0,1-0,2 mm long appressed hairs and with 1-1,3 mm long nearly patent hairs sitting partially on little tubercles 11. *A. pseudosinaicus*
- Hairs at the stipules and in the inflorescence in part black; leaves with a ± distinct petiole; the upper infructescences with a peduncle up to 5 cm long; legumes longer (in *A. sinaicus* sometimes shorter), with another kind of indumentum 10
10 Legumes 15-23 mm long and 4-4,5 mm high, covered with 0,1-0,4 mm long semipatent to patent hairs and with up to 2 mm long patent hairs, partly sitting on little tubercles
22. *A. triradiatus*
- Legumes mostly up to 18 mm long and 2-4 mm high, the longer hairs on the fruit up to 1,3 mm long 11
11 Hairs of the legume all ± adpressed, the shorter ones 0,05-0,15 mm long, the longer ones up to 1,3 mm long, partly sitting on little tubercles 12. *A. saharae*
- Most of the hairs on the legume ± patent, the shorter ones subappressed to semipatent, the longer ones up to 1,2 mm long, patent, often flexuous, partly sitting on little tubercles 17. *A. sinaicus*
12 Stem, petiole and rachis with closely appressed hairs 13
- Stem, petiole and rachis at least in part with semipatent to patent hairs 17
13 Whole plant covered densely with pure white hairs up to 0,5 mm long; legume appressed hairy or glabrous; leaflets on upper side very sparsely hairy or glabrous (see also 4) 4b. *A. coronilla* subsp. *semnanicus*
- Hairs longer, at the stipules and in the inflorescences also partly black; leaflets on upper side distinctly hairy 14

14 Legumes in the infructescence star-like arranged or in part reflexed, 6-7 (-10) mm long, with a short beak, with thin, rugose-wrinkled walls and a double indumentum: 0,1-0,3 mm long subappressed hairs and up to 1,5 mm long patent hairs without tubercles; 2-3 seeds in each locule 5. *A. filicaulis*

- Legumes in the infructescence erect or star-like but never reflexed, distinctly longer, 10-15 mm long, with firm, non-rugose walls; indumentum of other kind 15

15 Leaves sessile (without a distinct petiole); legumes acute at the apex, with a double indumentum, the longer hairs at least partly sitting on little tubercles 16

- Leaves with a ± distinct petiole; legumes with a curved beak, with a simple indumentum, hairs with no tubercles, up to 1,3 mm lang 15. *A. sesamoides*

16 Legumes mostly star-like arranged, at the base distinctly bigibbous, acute at the apex, with double indumentum of appressed hairs: 0,1-0,2 mm long hairs and up to 1 mm long hairs sometimes sitting on little tubercles; 7-10 seeds in each locule 1. *A. asterias*

- Legumes mostly erect, at the base rounded to slightly bigibbous, the dorsal groove distinctly widened towards the base; the long hairs of the fruit up to 1,4 mm long, appressed to semipatent, sitting on brownish coloured distinct tubercles; 4-5 seeds in each locule 19. *A. tadmorensis*

17 All hairs of the plant very short, at most up to 0,6 mm long; leaflets on upper side very sparsely hairy or often glabrous (see also 7/7*); legumes narrowly ovate or ovate-triangular 19

- Hairs up to at least 1,1 mm long, mostly longer (up to 1,9 mm); leaflets on upper side loosely to densely hairy, only in *A. sesameus* sparsely hairy but then legume linear 20

18 Hairs on the whole plant patent, merely white; legume narrowly ovate, 10-16 mm long, long acuminate at the apex, glabrous or densely patent hairy: 3-4 seeds in each locule 4a. *A. coronilla* subsp. *coronilla*

- Hairs at the stipules and in the inflorescences partly also black, on the lower side of the leaflets ± appressed; legume ovate-triangular, 6-9 mm long, with a short beak, glabrous or appressed hairy; 2 seeds in each locule 10. *A. persepolitanus*

19 Legumes 15-25 mm long and 5-6 mm wide, with a 0,5-1 mm long, curved beak; indumentum simple consisting of 1,5-2,3 mm long hairs which are sitting laterally near the base on little tubercles 20. *A. transjordanicus*

- Legumes shorter, only up to 18 (-19) mm long, if up to 22 mm long (in *A. schimperi*) then only up to 4 mm wide and with a 0,8-1 mm long straight beak; indumentum of the fruit always double 20

20 Leaves sessile (without a distinct petiole) 21

- Leaves always with a ± distinct petiole 22

21 Legumes obliquely narrow-oblong, rounded at the base, with a 2-3,5 mm long, slightly to distinctly curved beak; the double indumentum of the fruit consisting of 0,1-0,2 mm long subappressed hairs and up to 2,3 mm long semipatent to patent hairs without tubercles; 3-5 seeds in each locule 6. *A. geniculatus*

- Legumes narrowly oblong, often somewhat bent, at the base broadly bigibbous, at the apex with a short curved beak; the double indumentum of the fruit consisting of 0,05-0,15 mm long appressed hairs and up to 1,2 mm long adpressed to semipatent hairs without tubercles; 6-8 seeds in each locule 9. *A. longicaulis*

22 Legumes narrowly ovate-triangular, at the base distinctly bigibbous, 4-12 mm long, covered only with appressed hairs, the shorter ones 0,05-0,15 mm long the longer ones up to 1,5 mm long without tubercles; leaflets acute, on both sides densely silvery hairy 21. *A. tribuloides*

- Legumes longer, linear to narrowly ovate, at the base rounded or slightly broadened,

always partly with patent hairs; leaflets at the apex rounded or emarginate, if subacute (in *A. schimperi*) then hairs on the fruit up to 2,4 mm long and partly sitting on little tubercles 23

23 Infructescences all sessile or the upper ones at most with a peduncle up to to 0,5 cm long; legumes always erect, 9-18 mm long, the short hairs of the double fruit indumentum at least partly up to semipatent; leaflets on upper side sparsely to loosely hairy 24

- Infructescences all or at least the upper ones distinctly pedunculate; legumes star-like arranged or obliquely erect, rarely erect (in *A. schimperi*) but then leaflets on both sides densely hairy; the short hairs of the double fruit indumentum always adpressed 26

24 Legumes (1-) 2-4 in each leaf axil, with a distinctly curved or hooked beak; the longer hairs of the double fruit indumentum partly inserted in little tubercles; fruit without septum but fully bilocular because of the deeply intruded dorsal groove 7. *A. gryphus*

- Legumes 3-10 in one infructescence, with a very short, straight beak; the longer hairs of the double fruit indumentum all without tubercles; fruit with a distinct septum 15. *A. sesameus*

25 Infructescences with a 4-11 (-15) cm long peduncle,with 4-11(-15) fruits stellately arranged; legumes 10-15 mm long, with a straight or curved beak; the longer hairs of the double fruit indumentum up to 1,9 mm long, without tubercles; seeds 4-7 in each locule, rectangular, 2-3 mm long and 1,5-2 mm broad 18. *A. stella*

- Infructescences with a peduncle up to 4,2 cm long or the lower partly sessile, with (1-) 2-5 2-5 stellately arranged or up to erect fruits; legumes 15-22 mm long, with a short straight beak; the longer hairs of the double fruit indumentum up to 2,4 mm long, partly inserted in little tubercles; seeds 10-11 (-14) in each locule, globular, 1-1,4 mm in diameter 13. *A. schimperi*

4. Enumeration of species

1. **Astragalus asterias Hohen.** in Bull. Soc. Imp.Naturalistes Moscou 11: 343. 1838 ≡ A. *stella* auct. non Gouan: M.Bieb., Fl. Taur.-Cauc. 2: 191. 1808 ≡ *A. cruciatus* Link var. *asterias* (Hohen.)Sirj. in Repert. Spec. Nov. Regni Veg. 53: 230. 1944. **Type:** Iberia, *Steven* (BM!)

= *A. radiatus* Bunge in Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 11. 1868 in clave et loc. cit. 15 (1): 8. 1869 cum descriptione, nom. illeg. non Steven□ ≡ *Tragacantha radiata* (Bunge)Kuntze, Revis. Gen.: 947. 1891 ≡ *A. cruciatus Link* subsp. *radiatus* Batt. in Battandier & Trabut, Fl. Algérie 1: 255. 1889 ≡ *A. cruciatus* Link var. *radiatus* (Bunge)Sirj. in Repert. Spec. Nov. Regni Veg. 53: 228. 1944. **Syntypes:** in Aegypto prope Alexandriam, *Ehrenberg*; in Arabia petraea ad fines Palaestinae, *Boissier* (G!, G-BOIS!, P!). **Lectotype** (here designated): in Aegypto prope Alexandriam, *Ehrenberg* (P!; Iso: G!, G-BOIS!)

= *A. cruciatus* Link var. *elongatus* Kuntze in Trudy Imp. S.-Petersburgsk. Bot. Sada 10: 183. 1887. **Type:** prope Tiflis, *O. Kuntze* (not seen).

= *A. cruciatus* Link var. *desertorum* Kuntze in Trudy Imp. S.-Petersburgsk. Bot. Sada 10: 183, 1887. **Types:** Baku; Turkmenen-Steppe, *O. Kuntze* (not seen).

= *A. cruciatus* Link var. *arabicus* Sirj. in Repert. Spec. Nov. Regni Veg. 53: 230. 1944. **Type:** Arabia, El Kofe, Mhalleba, *Musil* (not seen).

= *A. cruciatus* Link var. *biserialis* Zohary, Fl. Palaestina 2: 455. 1972. **Holotype:**

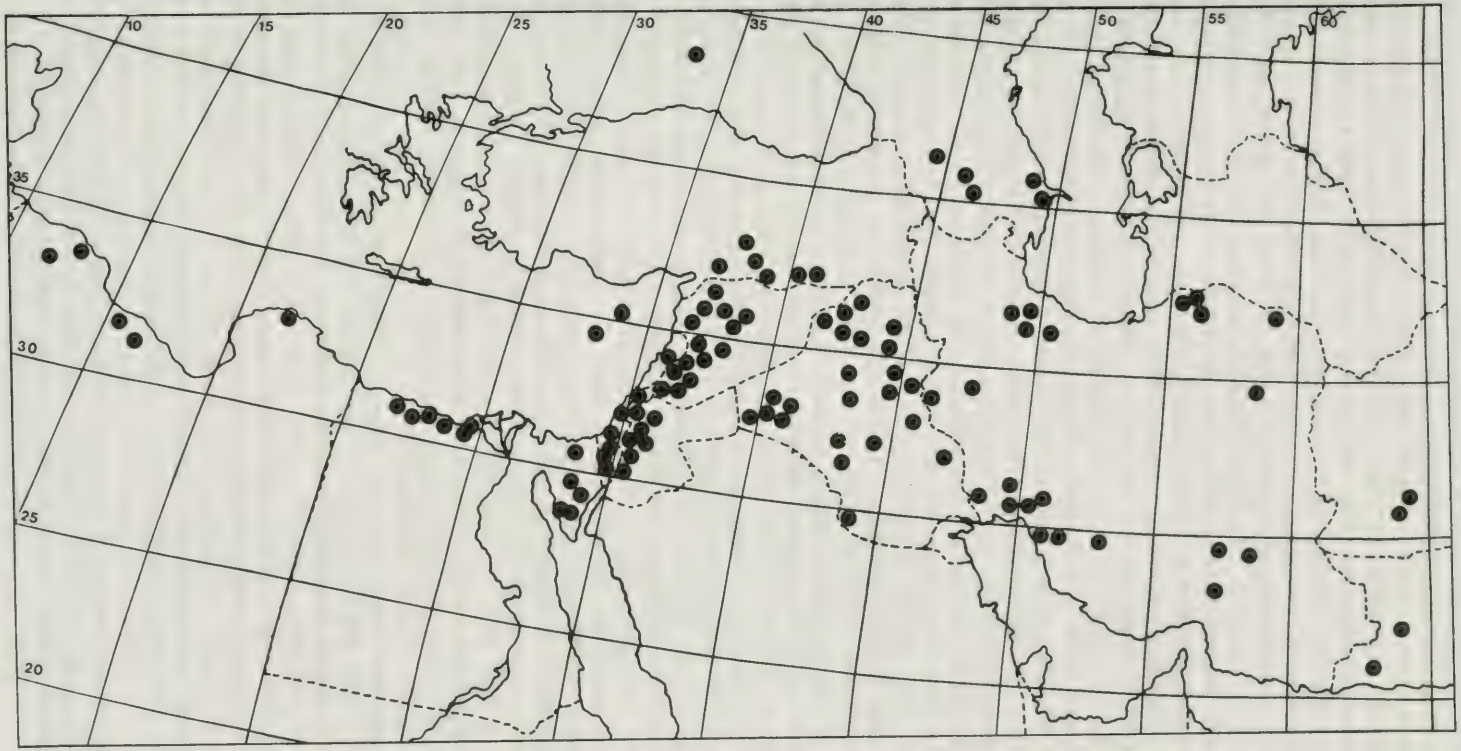
Palestine, Philistean Plain, Khan Yunis to Deir Belah, 30.3.1942, *D.Zohary 303* (HUJ!).

Figures: BONNET, E. & G. BARRATTE, Illustr. esp. nouv. rar. crit. Phanér. Tunisie: pl. VII, fig. 9-15. 1895 (as *A. radiatus*). ZOHARY, M., Fl. Palaestina 2: tab. 74 (as *A. cruciatus* Link).

Plants annual, branched at the base, covered with 0,2-1 mm long strongly adpressed white hairs, at the nodes and in the inflorescence also with black hairs. Stems 7-40 cm long, prostrate to ascending, finely sulcate, rather densely adpressed hairy. Stipules green, (1-) 2-3,5 (-4,5) mm long, triangular acuminate, at the base at a length of 0,5-0,8 mm adnate to the petiole, otherwise free, covered with adpressed white and black hairs. Leaves 2-4,5 cm long, sessile to subsessile; rachis covered with adpressed short white hairs. Leaflets 5-9 paired, 1,5-13 mm long and 0,8-3,2 mm wide, narrowly elliptic, acute to obtuse at the apex, both sides adpressed hairy. Inflorescences with a peduncle 1,5-4,5 cm long and hairy like the stem but with more and more black hairs toward the inflorescence, with 2-8 (-10) flowers in a densely crowded head. Bracts 1-2 mm long, membraneous, triangular acute, with appressed white and black hairs. Flowers nearly sessile. Calyx 3-4 mm long, campanulate, covered with black and white adpressed 0,2-0,6 mm long hairs, only at the teeth with longer hairs; teeth subulate, 1-1,3 mm long, ca. 1/2 the length of the tube. Corolla mauve or cream. Standard 6-9 mm long, 2,2-3,5 mm broad, narrowly elliptic, emarginate at the apex. Wings 4-5 (-6) mm long; limb oblong, emarginate at the apex, (1,5-) 2-3 mm long; the auricle ca. 0,5 mm long, claw 2-2,5 mm long. Keel (3-) 4-4,5 mm long; limb triangular-obovate, acute, (1-) 1,5-1,8 mm long and 1 mm wide, lower edge strongly rounded, upper edge slightly curved; claw 2-2,5 mm long. Staminal tube ± straightly cut. Ovary sessile, hairy; style short, glabrous. Legumes sessile, starlike arranged, linear-oblong, bigibbous at the base, acute at the apex, 10-15 mm long, 2,5-4 mm high and 2-3 mm broad, rounded on ventral side, deeply grooved on dorsal side, covered with 2 kind of adpressed hairs: short ones 0,1-0,2 mm long and much longer, up to 1 mm long and inserted in little tubercles. Pods opening along the ventral suture, completely bilocular. Seeds 7-10 in each locule, kidney-shaped, 1,2-2,5 mm long and 1-2,2 mm broad, yellow, smooth.
Flowering time: III-IV, but occasionally nearly all the year. **Occurence:** sandy flats, dunes in desert and semidesert conditions, from the plains up to 1500 m.
Distribution: Libya, Egypt, Israel, Jordan, Lebanon, Syria, Iraq, Turkey, Cyprus, Georgia, Azerbaijan, Iran, Afghanistan, Pakistan. Map 2.

Specimens seen:

France. Dep. Hérault: Port Juvenal [Montpellier], 29.5.1826, ? (K: adventitious).
Libya. Tripolitania: Gebel Nefoussa, 27 km SE of Giado 650-700 m, 16.3.1970, *Davis 49642* (K) & *Boulos & Khalifa 3536* (CAI) - near Tripoli airport, 6.4.1970, *Davis 50591* (K) - Tripolis, ad Gargaresch, IV.1933, *Bornmüller 689* (B) - 30 km SE of Misurate, 11.2.1958, *Park 279* (K) - Kabila Forgian, Sirte, 6.2.1961, *Khalifa & Karamanli 833* (K). -- Cyrenaica: between Agedabia and Marsa Brega, 26 km from Brega, 17.4.1939, *Sandwith 2671* (K) - Ras El Hi-lal, 13.4.1954, *Guichard Cyr/85* (BM) - Not exactly to locate: Carian Hills, 19.3.1952, *Guichard LIB/272* (BM) - Torud El Maghia delta of inland wash channel, 1966, *Mitchell 121* (K).
Egypt: Al-Dabaa, ca. 25 km NW El Alamein, 9.3.1990, *Gazer* (SUEZ CANAL UNIV.) - Sidi Abd-el-Rahman NW of El Alamein, 9.3.1990, *Gazer* (SUEZ CANAL UNIV.) - El Hauwa-riya between El Amirya and Burg-el-Arab, 7.3.1990, *Gazer & Kamel* (SUEZ CANAL UNIV.) - El Hauwariya, between Ikingi Maryut and Burg-el-Arab, 7.3.1990, *Gazer & Kamel* (SUEZ CANAL UNIV.) - 7 km W Burg-el-Arab an der Straße nach El Hammam, 3.4.1989, *Podlech 44560* (Hb. PODL.) - Burg-el-Arab, 22.3.1956, *Ibrahim* (CAI) - dto., 23.3.1957, *Saad El Kuami* (CAI) - dto., 24.3.1961, *Täckholm* (CAI) -



Map 2. Distribution of *Astragalus asterias*

dto., 8.3.1990, *Gazer* (SUEZ CANAL UNIV.) - dto., near staff resthouse, 7.3.1990, *Gazer* (SUEZ CANAL UNIV.) - Marsa Matruh, 25 km W Alexandria, *Hughes* (K) - ad occasum lacus Mareotici prope Amriya, 13.4.1908, *Bornmüller 10639* (B) - Ras El Hekma, Mariut, 2.5.1955, *El Hadidi* (CAI) - ad lacum Mareotidem, 4.3.1877, *Letourneux 50* (BM, G-BOIS, P) - Alexandria, *Ehrenberg* (G, G-BOIS, P) - dto., *Montbret* (G, G-BOIS, - P) - dto., 1847-1848, *Kralik* (P) - dto., 28.3. 1856, *Samaritani* (G-BOIS) - El-Amiriya S of Alexandria, 19.3.1989, *Gazer* (SUEZ CANAL UNIV.) - Alexandria desert road, 19.3.1989, *Gazer* (SUEZ CANAL UNIV.) - Ras-el-Hekma, 40 km S Marsa Matruh, 8.3.1990, *Gazer* (SUEZ CANAL UNIV.). -- Sinai: El Arish, V.1925, *Eig* (HUJ) - 2-3 hours SE El Arish, 2.5.1925, *Eig* (HUJ) - Gebel El Raha near Gebel Zarqa, 700, 9.4.1970, *Danin* (HUJ) - Ras El Gineina, 10.10.1969, *Danin & Halevy* (HUJ) - 2 km W St. Catherine Monastery, 1.4.1971, *Danin* (HUJ) - St. Catherine, 13.4.1989, *Gazer & El Bous* (SUEZ CANAL UNIV.). -- Not exactly to locate: Arabia petraea ad fines Palestinae, IV.1846, *Boissier* (G, G-BOIS, P) - Egypte, *Delile* (BM).

Israel: upper Galilee, Manara, 8.4.1959, *Ginsburg* (HUJ) - env. of Ayeleth Hashahar, 11.3.1954, *Feinbrun* (Hb. PODL.) - Mizpeh road, 12.4.1912, *Meyers 6556* (G) - upper Jordan valley, above Nahal Roked, the Yarmuk, 8.3. 1984, *Liston 7-84-174/15* (HUJ) - Mahanyim, 19.3.1933, *Eig* (HUJ) - Tiberias, Qiryat Shemnel, 28.3.1923, *Eig* (HUJ) - Gesher Nehalim, 24.3.1926, *Eig & al.* (HUJ) - Mt. Carmel, near coast, 28.3.1926, *Naftolsky* (HUJ) - Mt. Carmel, E' slopes, 12.5.1927, *Eig & al.* (HUJ) - Tel-Aviv, Yarqon river, 18.4.1941, *Zohary* (HUJ) - Jaffa [= Tel Aviv], 25.3.1873, *Dingler* (B) - dto., 7.4.1897, *Bornmüller 542* (B, G, K) - env. of Petah-Tiqva, IV.1942, *Halevi* (HUJ) - Qubeiba to Ramle, 1.4.1928, *Eig & al.* (HUJ) - Hartuv to Soho, 23.4.1926, *Eig & Zohary* (HUJ) - Deir-esh Sheikh, 19.4.1925, *Zohary* (HUJ) - Ben Shemen, 1.4.1923, *Naftolsky* (HUJ) - near Mrar on way to Rehovat, 7.4.1935, *Eig & al.* (HUJ) - Gedera to Bashit, *Eig & al.* (HUJ) - N of Ruhama, 16.4.1928, *Eig & al.* (HUJ) - env. of Faluja [= Zamet Pelugot], 16.4.1928, *Zohary* (HUJ) - Canada Park near Latrun, 31.3.1982, *Zohary & Liston 7-82-50/11* (HUJ) - on way from Kefar Urija to Hulda, 28.3.1922, *Eig* (HUJ) - Hulda, 28.3.1922, *Eig* (HUJ) - Hartuv, 7.3.1924, *Eig* (HUJ) - near Beit Shemesh, 13.4.1983, *Heyn & Liston 7-83-62/1* (HUJ) - Jerusalem, 1846, *Boissier* (G-BOIS) - dto., III. 1857, *Roth 361* (M) - dto., II.1889 *Jouannet-Marie 548* (W) - dto., Mt. Scopus, 27.3.1939, *Leinkram & Grizi,* Fl. Terr. Israel exs. *638* (B, BM, G, M, MA, P) - Jerusalem, Givat Ram, 29.3.1982, *Liston* (M) - 15 km SE Beersheba, Wadi Mashash Farm, 23.3.1987, *Hepper 8701* (K) - 25-28 km E Beersheba, 26.3.1961, *Zohary* (HUJ) - Negev, Advat, 14. 4.1976, *BRECKLE 4226* (Hb. PODL.) - Tel-'Arad, 9.4.1922, *Eig* (HUJ) - Beer Mashabim, 15.4.1949, *Zohary* (HUJ) - Sede Boqer, 22.3.1983, *Liston 7-83-23/8* (HUJ) - 3 km W Mitzpe Ramon, 27.4.1987, *Danin* (HUJ) - *Borot Loz, 6.4.1983, Liston & Danin 7-83-44/3* (HUJ) - Nahal Nitzana, 4,5 km N Har Ramon, 960 m, 16.4.1986, *Danin* (HUJ). -- Under Isra-elian administration: Majdal, 9.5.1927, *Eig & al.* (HUJ) - Mann Valley, 2,5 km NW Majdal Shams, 1400 m, 4.6.1986, *Liston & Shmida 491/2* (HUJ) - Fig [= Afiq] au-dessus de Tiberiade, 19.3.1954, *Pabot* (G) - Mt. Gilbóa, 29.4.1926, *Naftolsky* (HUJ) - Judaean Desert, on way to Ein Fuar, 2 km from the road, 27.3. 1935, *Eig & Zohary* (HUJ) - N of Jericho, 5.4.1927, *Eig & al.* (HUJ) - Jericho, 28.2.1925, *Naftolsky* (HUJ) - Jerusalem to Mar Saba, 21.3.1926, *Eig & Zohary* (HUJ) - Khan Yunis to Deir Belah, 30.3.1942, *Zoha-ry* (HUJ). -- Not exactly to locate: Tel Tara, 3.4.1930, *Harding 240* (K) - Wady El-Jib, 1.7.1919, *Johnson* (K) - Tufileh, 1858, *Roth 359* (M).

Jordan: near Zarqa, Rawi bridge, Deir Alla, Gilead, 24.3.1953, *Simpson 53366, 53377* (K) - Ein Suella to Es-Salt, 14.4.1929, *Eig & Zohary* (HUJ) - env. of Saheb, 7.5. 1927, *Eig & al.* (HUJ) - Es-Salt to Amman, 14.4.1929, *Eig & Zohary* (HUJ) - 10 km N Amman, 14.4.1929, *Eig & Zohary* (HUJ) - Amman, Al-Jubaiha, University campus, 16.4.1978, *Nuaimi 3736* (M) - Amman, Ouadi Ratam, 25.4.1955, *Kasapligil JR.470* (G) - Moabit, Ain Hesban, 660 m, 26.4.1911, *Meyers & Dinsmore 3680* (K) Arnon Delta, 3.4.1925, *Eig* (HUJ) - Wadi Dana WSW Dana, 650 m, 10.4.1986, *Baierle 86-1633* (Hb. BAIERLE) - Edom, Shobak, Al Fujeij bei Chirbet Samra, 1260 m, 21.4.1987, *Baierle & Pimpl 87-588* (Hb. BAIERLE) - 26 km S Ma'an, 18.4.1929, *Eig & Zohary* (HUJ) - Ma'an, 15.4.1929, *Naftolsky* (HUJ) - Wadi Musa, 17.4.1929, *Eig & Zohary* (HUJ) - Ein Musa to Ma'an, 17.4.1929, *Eig & Zohary* (HUJ).

Lebanon: El Kaa, 1.7.1957, *Pabot* (G) - inter Der-el-Ahmar et Aineta, 27.5.1910, *Bornmüller 11564* (B) - entre Chlifa et Yamouni, 27.4.1957, *Pabot* (G) - prope Baalbek, 20.5.1910, *Bornmüller 11569* (B) - Tabia (SW Baalbek), 27. 4.1957, *Pabot* (G) - Marjayoun, 3.5.1955, *Mouterde 11481* (G).

Syria: Aleppo, *Russell* (BM) - dto., inter Dschebrin et Tijara, 23.3.1910, *Handel-Mazzetti 278* (W) -

Djebel Muhassan pr. Aleppo, 22.3.1865, *Haussknecht* (G-BOIS) - Kwaris inter Aleppo et Euphratem, ad rivum Nahr ed Deheb, 24.3.1910, *Handel-Mazzetti 290* (W) - inter Aleppo et flumen Euphrat, Oum Trekie, 22.4.1933, *Wall* (B) - de Meskène à Caracol [Qaraqol] Hamman, 20.4.1928, *Gombault 332* (P) - El Hammam, ad Euphratem inter Meskene et Der es Sor, 27. 3.1910, *Handel-Mazzetti 462* (W) - dto., 20.4.1908, *Harad-jian 6931* (G) - d'Alep à Hama, 1926, *Gombault 328* (P) - Hama, 16.4. 1934, *Gombault 123* (P) - Homs, 13.5.1931, *Zohary* (HUJ) - entre Palmyra et Homs, IV.1911, *Haradjian 4051* (G) - Palmyra, prope ruinas, 16.4.1965, *Roessler 4826* (M) - dto., 11.3.1979, *Licht* (B) - 8 km W Selime, 460 m, 2.5.1933, *Eig & Zohary* (HUJ) - Qaryatein, 23.4. 1935, *Mouterde 3910* (G) - Zebdani, 26.4.1900, *Post* (B) - Bludan, 29.5.1880, *Peyron 1040* (G) - Souk Wadi Barada (NW Damascus), 9.4. 1933, *Mouterde 1916* (G) & *Gombault 2376* (P) - Hassetché, 320 m, 29.4.1933, *Eig & Zohary* (HUJ) - Damascus, Doumar, 15.4.1891, *Peyron* (G) - Kissoué [= Al Kiswah], 9.4.1953, *Pabot* (G) - SE Damascus, station Deir el Hajar, 31.8. 1956, *Pabot* (G) - Qrahta (SE Damas), 27.5.1952, *Pabot* (G) - Hauran, Sunamen, 26.4.1895, *Peyron* (G,) - Mazra'a, 18. 4.1938, *Mouterde 6282* (G) - Khabab, 28.2.1956, *Pabot* (G) - Djebel Druze, 1943, *Mouterde 7487bis* (G) - S Deraa, 29.2.1956, *Pabot* (G). -- Not exactly to locate: Jebel el Amiri (Tamri) (Syrie du Nord), 19.4.1931, *Gombault 1347* (P) - Dunes d'Abou el Faouaris (Desert de Syrie), 7.3. 1929, *Gombault 655* (P) - Khan Abou Chamat (Desert de Syrie), 29.3.1931, *Gombault 1346* (P) - inter Aleppo et Aintab, 23.4.1865, *Haussknecht* (G-BOIS).

Iraq. Sulaimaniya Distr. (MSU): Pir Omar Gudrun, IV.1867, *Haussknecht* (P). -- Upper Jazira Distr. (FUJ): 11 km W Beled Sind-jar, 460 m, 28.4.1933, *Eig & Zohary* (HUJ) - 7 km W Tel-Afar, 26.4.1933, *Eig & Zohary* (HUJ) - S Mosul, 250 m, 2.4.1969, *Anders 2492* (W, Hb. PODL.) & 5.5.1969, *Anders 2524* (W, Hb. PODL.) - 5 km W Hamam Ali, 3.4.1968, *Anders 1700* (W) - ruins of Hadre, 11.3.1963, *Barkley 4130* (W) - dto., 20.4.1964, *Haddad & Barkley 7862* (W) - Shargat, 10.3.1919, *Calder* (BM). - - Nineveh Distr. (FNI): 35 km NE Mosul, 26.4.1933, *Eig* (HUJ). -- Kirkuk Distr. (FKI): 14 km NW Kirkuk, 16.4.1933, *Eig & Zohary* (HUJ) - Kirkuk, 28.*4.1893, Bornmüller 1204* (B). -- Persian Foothills Distr. (FPF): Jabal Hamrin inter Sharaban [= Muqdadîya] et Jalaula, 4.4.1957, *Rechinger 9008* (B, M, W) - 27 miles W Khanaqin, 18.3.1929, *Cowan & Darlington 156* (K) - Khanaqin, 4.4.1957, *Rechinger* (W) - 16 km SE Badra, 12.4. 1957, *Rechinger 9207 = 13940* (M, W). -- Western Desert Distr. (DWD): 20 km S H3 (oil pumping station), 7.6.1957, *Rechinger 12572* (W) - 35 km W Rutba, 7.6.1957, *Rechinger 9921* (G, M) - 20 km W Rutba, 6.5.11962, *Barkley & Brahim 2253* (W) - Rutba, 20.4.1933, *Meinertzhagen* (BM) - 20 miles S Rutba, 21.4.1933, *Meinertzhagen* (BM) - 26 km E Rutba versus Ramadi, 28.5.1957, *Rechinger 12847* (W) - Ramadi, III.1918, *Graham 84* (BM). -- Southern Desert Distr. (DSD): Jumaymah, 140 km SW As-Salman, 390 m, 22. 4.1957, *Rechinger 13748* (W). -- LEA: Shatt at-Tib, ca. 70 km N Amara, 27.4.1957, *Rechinger 15833* (W). -- Eastern Alluvial Plain Distr. (LEA): Deltawah [= Khalis], foot-hills of Jebal Hamrin, 12.4.1933, *Eig & Zohary* (HUJ). -- Central Alluvial Plain Distr. (LCA): inter Bagdad et Babylon (Hilleh), 3.3.1893, *Bornmüller 343* (B) - Babylon, 21.4.1898, *Bornmüller 1204c* (B). -- Not exactly to loca-te: near Castle of Sedjim Kala (Exped. to Euphrates), IV.1836, *Chesney 66* (G, M, P, W).

Turkey. Prov. Nevsehir: in valle fluvii Kizil Irmak inter Gülsehir (Arapsu) et Hacibektas, 950 m, 3.7.1957, *Rechinger 53953* (W). -- Prov. Maras: Maras, 30.4.1934, *Balls & Gourlay B.904* (K). -- Prov. Gaziantep: Gaziantep, 3.5.1935, *Balls B.2231* (BM) - Aintab [= Gaziantep], 5.4. 1865, *Haussknecht* (W). -- Prov. Urfa: Biredjik [= Birecik], Haschnadi, 2.4.1888, *Sintenis 246* (G) - Hian to Siverek, 700 M, 18.5.1957, *Davis & Hedge D.28264* (BM, K) - Harran, 10 km SSE Urfa on road to Akcakale, 3.5.1988, *Maxted & al. 5071* (Hb. PODL.). -- Prov. Mardin: Mardin, III.1867, *Haussknecht* (K) - Nusaybin, 12 km from Mardin, 750 m, 22.5.1957, *Davis & Hedge D.28466* (BM, K).

Cyprus: pr. Nikosia, 5.4.1880, *Sintenis & Rigo 433* (G-BOIS, K, P) - Eurysthon, 2000', 12.3.1935, *Syngrasides 816* (K) - Kalyvakia merah, 8.4.1957, *Merton 3093* (K) - in mte. Kythraea, 1880, *Sintenis & Rigo 433* (G-BOIS, P).

Georgia: Tiflis [= Tbilisi], *Steven* (BM) - dto., 1882, *Pichler* (K) - dto., 12.6.1882, *Schumann* (P). -- Not exactly to locate: in aridis Georgiae Caucasiae, 1835, *Hohenacker* (BM, G, G-BOIS, K, M, W).

Azerbaijan: terr. Elisabethpol [= Kirovabad], *Hohenacker* (G-BOIS, M, P) - in locis aridis terr. Elisabethpolensis et prov. Karabach, 1828, *Hohenacker* (G) - Prov. Elisabethpol, circa Terter, IV.1900, *Fedossejew* (B) - steppa Shirvan, m. Kalmas, 23.4.1931, *Sachokia* (K) - steppa Shirvan, pr. Geoktshaj, 6.5.1931, *Sachokia* (M) - Baku, 1842, *Meyer* (G-BOIS, P) - dto., 1867, *Seidlitz* (G-BOIS) - dto., 1882, *Pichler* (K) - dto., 19.4.1902, *Bornmüller 6704* (B, BM, G, K, P).

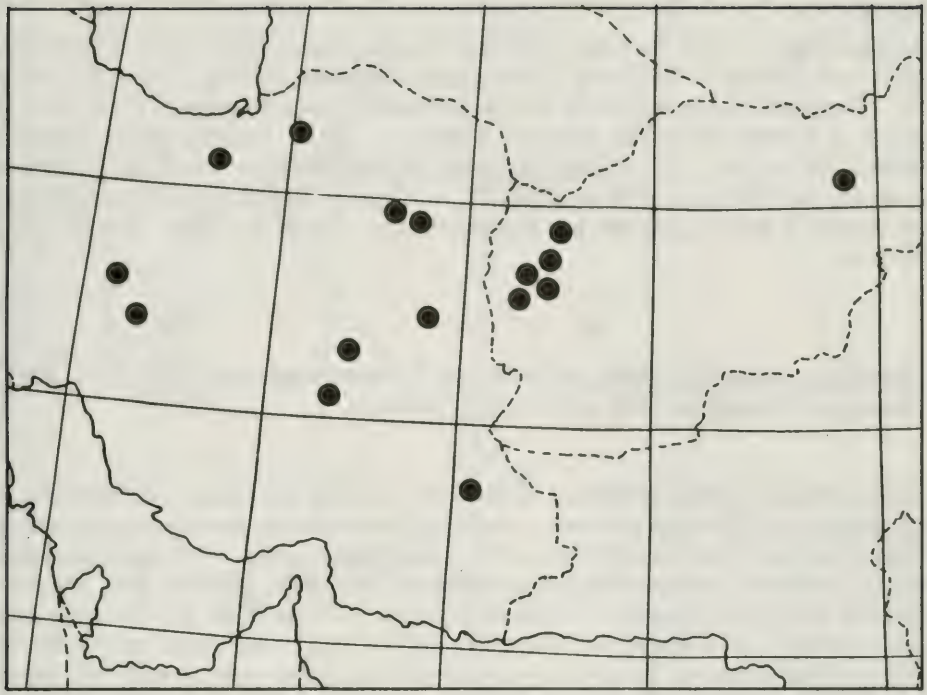
Iran. Prov. Azerbaidjan-e-Sharqi: Dasht-e Moghan, ad ripas fluvii Araxes (Aras), 2 km E Alirezaabad-e-Jadid, 21.5.1971, *Rechinger 40092* (W) - S Mianeh, 4500', 2.5. 1963, *Bowles Sholarship Bot. Exped. 1160, 1175* (K) - 13 km SE Mianeh, 5500', 6.5.1929, *Cowan & Darlington 729* (K). -- Prov. Gilan: prope Rudbar, 7.5.1902, *Bornmüller 6708* (B, W) - inter Rudbar et Rustamabad, 3.5.1902, *Bornmüller 6706* (B) - Mendjil [= Manjil], 400 m, 10.5.1902, *Bornmüller 6707* (B). -- Prov. Zanjan: 10 km W Takestan versus Zanjan, 1300 m, 29.6.1971, *Rechinger 42326* (W) - Takestan, 1200 m, 1.4.1966, *Zhumer 428* (BG) - 25 km E Qasvin, 26.4.1970, *Kasy 467* (W). -- Prov. Mazanderan: Maraveh Tappeh, 18.5.1976, *Hewer 3773A* (K) - 9 km E Maraveh Tappeh, 22.4.1986, *Assadi & Massoumi 55483* (TARI, Hb. PODL.) - E Maraveh Tappeh near Ghazanghayeh, 23.4. 1986, *Assadi & Maassoumi 55567* (TARI, Hb. PODL.). -- Prov. Khorasan: Golestan Park, Sharlegh station, 1300 m, 8.5.1984, *Maassoumi* 47573 (TARI, Hb. PODL.) - inter Sharlegh and Cheshme Khan, 7.5.1984, *Maassoumi 47546* (TARI, Hb. PODL.) - 56-60 km N Gonabad inter Mahneh et Emrani, 900 m, 9.5.1975, *Rechinger 51405* (W) - 39 km from Lotfabad to Kalat-e Naderi, 580 m, 26.4.1986, *Assadi & Maassoumi 55717* (TARI, Hb. PODL.). -- Prov. Kermanshahan: 20 km E Kermanshah, S base of Kuh-i-Parrau, 4400', 6.4. 1960, *Bent & Wright 406-107* (W) - Khosrovi, 8.4.1950, *Behboudi 5579-E* (W) - Gilan-e Gharb, Viginan, 8.5.1948, *Behboudi 70* (W) . -- Prov. Khuzestan: Haftgel to Masjed Soleyman, Simeyli, 6.3.1972, *Iranshahr & Termeh 41006-E* (W) - 39 km from Ramhormoz on road to Darvishan, 6..9. 1978, *Runemark & Mozaffarian 30957* (TARI) - 24 km from Behbehan on road to Ramhormoz, 400 m, 6.3.1978, *Runemark & Mozaffarian 30900* (TARI) - near Aghajari, 4.3.1972, *Iranshahr & Termeh 14981-E* (W) - 12 km from Behbehan to Aghajari, 3.3.1972, *Foroughi 3232* (TARI) - Genaueh to Dagonhadan, 18 km from Chaharrahe, Bibi-Hakimeh toward Dagonhadan, 2.3.1972, *Iranshahr & Termeh 14965-E* (W). -- Prov. Bushehr: Bushehr, 13.4.1885, *Stapf* (K) - dto., 4.3.1895, *Bornmüller 341* (B) - dto., 1926, *Hower 55* (K). -- Prov. Fars: prope pagum Dalechir inter Abuschir et Schiras, III.1842, *Kotschy* (P) - Maharlu, 5.4.1936, *Gauba 944* (B) = *Parsa 650* (but not collected by him but by *Gauba*) (K). -- Prov. Kerman: prope Khatunabad, 70 km NW Bam, 25.4.1948, *Soják 2683* (PR) - ad vicum Abareq, 53 km NW Bam, 25.4.1973, *Soják 2635* (PR) 96 km S Jiroft, 14.4. 1972, *Babakhanlou 23037* (W).

Afghanistan. Prov. Balkh: Mazar-i-Sharif, 11 km S Pul-e-Imambukri, 600 m, 21.3.1968, *Breckle 946* (Hb. BRECKLE). -- Prov. Helmand: Mohammad Rahim Qalay, S Darweshan, to Jabbar Oza Dasht, 710 m, 17.4.1972, *Anders 8485* (Herb. PODL.). -- Prov. Kandahar: Registan desert, prope Baghat 19.5.1967, *Rechinger 34623* (W) - 7 km S Baghat, 720 m, 20.5.1967, *Freitag 739* (Hb. FREITAG).

Pakistan. Baluchistan: Makran, Panjgur, 1000 m, 20.4. 1965, *Rechinger 28175* (W) - 20-30 km S Panjgur, 20.4. 1965, *Rechinger 30125* (W) - 8-25 km W Awaran versus Tur-bat, 11.4.1965, *Rechinger 27713, 27714 pp.* (W).

2. Astragalus biovulatus Bunge in Mém. Acad. Imp. Sci. Saint Pétersb. 11 (16): 11. 1868 in clave et l.c. 15 (1): 11. 1869 cum descriptione ≡ *Tragacantha biovulata* (Bunge) O.Kuntze, Revis. Gen. 2: 943. 1891. **Syntypes:** Persia media pr. Schahrud et prope Ssertschah, *Bunge & Bienert*; pr. Jesd, *Buhse* (G-BOIS!). **Lectotype** (here designated): [Persia] Schahrud, 19.5.1858, *Bunge & Bienert* (P!; Iso: G-BOIS!, W!)

Plants annual, stemless, more or less densely covered with thin, sometimes wrinkled, 0,5-1,2 mm long patent white hairs. Stipules hyaline, 2,5-3 mm long, triangular acuminate, very shortly adnate to the base of petiole, otherwise free, white ciliate. Leaves 1,5-3,5 cm long, petiole 0,5-1,5 cm long, like the rachis sparsely hairy. Leaflets (3-) 4-5 (-6) paired, 3-6 mm long, 1,5-2,8 mm broad, cuneate obcordate, broadly retuse at the apex, glabrous above, ± densely patent hairy below. Inflorescences sessile, radical, with 8-10 flowers in a crowded head. Calyx covered at the base of the tube with subappressed hairs, towards the teeth densely covered with patent hairs, teeth subulate, ca. 0,8 mm long. Corolla yellowish. Standard 3,5-4 mm long, ca. 1,5 mm broad, oblong, retuse at the apex. Wings ca. 3,5 mm long, limb narrowly oblong, obtuse at the



Map 3. Distribution of *Astragalus biovulatus*

apex, ca. 2 mm long and 0,8 mm broad; auricle ca. 0,5 mm long, claw ca. 1,5 mm long. Keel ca. 3 mm long, limb triangular-obovate, acute, with the lower edge strongly rounded and the upper edge only slightly rounded, ca. 1,7 mm long and 1 mm broad; auricle very short, the claw ca. 1,3 mm long. Staminal tube cut at a right angle. Ovary sessile, hairy, style glabrous. Legumes sessile, ovate, with broadly rounded base, 5-6 mm long, 3-3,5 mm high and 2,5-3 mm broad, slightly carinate ventrally and deeply grooved dorsally, acuminate at the apex with a upwards curved beak ca. 0,5 mm long; valves covered with patent hairs 0,7-1 mm long. Legume opening at the ventral side, completely bilocular. Seed 1 in each locule, 1,5-2 mm long and 1,5-1,8 mm broad, smooth, brown.
Flowering time: IV-V. **Occurence:** in steppe and semidesert areas, ascending up to 2000 m.
Distribution: Syria, Iran, Afghanistan. Map 3.

Specimens seen:

Iran. Prov. Semnan: Shahrud, 19.5.1858, *Bunge* (G-BOIS, P, W). -- Prov. Khorasan: 13 km N Kashmar versus Rivash, 1300 m, 4.5.1975, *Rechinger 51161* (W) - Gonabad inter Kain (Gaen) et Turbat-e Haidari, 26.5.1948, *Rechinger & al. 4310 pp.* (W) - Helali, inter Gonabad et Bejestan, 125o m, 10.5.1975, *Rechinger 51469* (W, Hb. PODL.) - prope Sser tschah, V. 1859, *Bunge* (P). -- Prov. Hamadan: in agro Ecbatanensis [= Hamadan], 1882, *Pichler* (G). -- Prov. Esfahan: Najafabad, W Esfahan, 21.4.1963, *Bowes Scholarship Bot. Exp. 942* (K) - entre Esfahan et Abadeh, 27.4. 1956, *Schmid 5351 pp* (W). -- Prov. Yazd: prope Jesd, *Buhse* (G-BOIS). -- Prov. Kerman: between Mahan and Kerman, ca. 1900 m, 6.5. 1977, *Assadi 23287* (TARI) - prope Kerman, ca. 2000 m, 28. 4.1892,

Bornmüller 3754 (B). -- Prov. Baluchestan: in ditione vulcani Taftan, 1750 m, 25.4.1977, *Rechinger 54750* (W).

Afghanistan. . Herat: between Obeh and Khodja Chisht, 1600 m, 10.5.1969, *Hedge, Wendelbo & Ekberg W-7826* (GB). -- Prov. Farah: Shindand, 1200 m, 10.4.1949, *Köie 4299* (W) - Kareze Jan Mohammad an der Straße von Anardara nach Shindand, 1170 m, 25.4.1977, *Podlech & Jarmal 29170* (Hb. PODL.) - Sangbur, 15 km N Anardara an der Straße nach Shindand, 840 m, 24.4.1977, *Podlech & Jarmal 29102a* (Hb. PODL.) - 17 km S Anardara an der Straße nach Delaram, 1300 m, 25.4.1977, *Podlech & Jarmal 29199* (G, Hb. PODL.). -- Prov. Kabul: N Sarobi ggenüber dem Naghlu-Stausee, 1200 m, 21.4.1967, *Breckle 235* (Hb. BRECKLE).

3. Astragalus cornubovis Lipsky in Trudy Imp. S.-Petersburgsk. Bot. Sada 18: 23. 1901.
Holotype: Transcaspia, 1889, *Antonow* (LE, not seen).

Plants annual, branched at the base, covered with strongly adpressed 0,1-0,7 mm long white hairs. Stems 15-26 cm long, prostrate to ascending, finely sulcate, sparsely covered with up to 0,5 mm long hairs, more densely hairy at the nodes. Stipules green, 1-2,5 mm long, triangular acute, at the base at a length of 0,5-1 mm adnate to the petiole, otherwise free, covered with adpressed white hairs. Leaves 2,5-5 cm long; petiole 1-2,5 cm long, like the rachis sparsely hairy. Leaflets (2-) 3-4 paired, 3-9,5 mm long and 2-6 mm broad, ovate, but the end leaflet mostly obovate, retuse at the apex, upper side glabrous, lower side covered with adpressed hairs up to 0,5 mm long. Inflorescences sessile or with a densely hairy peduncle up to 0,5 cm long, with 3-7 flowers in a dense head. Bracts membraneous, 1 mm long, lanceolate acute, ciliate. Flowers nearly sessile. Calyx ca. 3 mm long, campanulate, densely adpressed hairy; teeth narrowly triangular, 0.8-0,9 mm long, nearly 1/2 the length of the tube. Corolla white, with blue tipped keel. Standard ca. 6 mm long and 2,2 mm broad, narrowly ovate, retuse at the apex. Wings 5-5,5 mm long, the limb narrowly oblong, obtuse at the apex, 3-3,3 mm long and ca. 1 mm broad; auricle ca. 1 mm long, claw 1,5-2,2 mm long. Keel ca. 5 mm long, limb obliquely obovate, with strongly rounded lower edge and slightly curved upper edge, rounded at the apex, ca. 2,5 mm long and 1,5 mm wide; claw 1,5-2,2 mm long. Staminal tube curved at the tip. Ovary sessile. Legumes sessile, linear-oblong to narrowly lanceolate, slightly curved or straight, 12-16 mm long, 3,5-4 mm high and 3-3,5 mm broad, rounded at the base, acute at the apex, carinate on ventral side, deeply grooved on dorsal side, densely covered with 0,15-0,8 mm long appressed hairs, at the margins sometimes also with subappressed hairs. Pods opening along the ventral suture, with a septum ca 1 mm broad, but completely bilocular because of the deeply intruding dorsal groove. Seeds ca. 5 in each locule, kidney-shaped, ca. 2,2 mm long and 2 mm broad, brown, smooth.
Flowering time: IV-V. **Occurence:** Steppes on sandy-loamy soils, up to 1700 m.
Distribution: Turkmenistan, Uzbekistan, Iran, Afghanistan. Map 4.

Specimens seen:

Iran. Prov. Khorasan: 56-60 km N Gonabad inter Mahneh et Emrani, 900 m, 9.4.1975, *Rechinger 51405* (B, G, K, M). -- Prov. Esfahan: 70 km NW Nain versus Ardestan, 1700 m, 18.5.1975, *Rechinger 52026a* (W).

Afghanistan. Prov. Herat: 40 km S Herat an der Straße nach Shindand, 1500 m, 13.4.1973, *Anders 9623a* (G).

Map 4. Distribution of *Astragalus cornubovis*
● specimen seen; ★ records from the literature

4. **Astragalus coronilla Bunge** in Mem. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 11 in clave et l.c. 15 (1): 10. 1869. **Syntypes:** Persia, pr. Isfahan, *Aucher-Eloy 4440 pp.* (BM!, P!, W!); prope Sser Tschah, Kerman, inter Kerman Jesd et Isfahan, inter Isfahan et Kaschan, all collected by *Bunge & Bienert.* **Lectotype** (hear designated): Ispahan, *Aucher 4440* (P!; Iso: BM!, W!)

Plants annual, simple or branched at the base, covered with 0,2-0,5 mm long ± patent or appressed white hairs. Stems reduced or up to 15 cm long, prostrate to ascending, sometimes thick, finely sulcate, rather densely hairy or sometimes glabrescent. Stipules whitish, 2-2,5 mm long, triangular acuminate, at the base very shortly adnate to the petiole otherwise free, ciliate at the margin. Leaves 3-5 (-8,5) cm long; petiole 1,5-3 cm long, like the rachis densely covered with short patent or appressed hairs. Leaflets 3-5 (-7) paired, 3-12 mm long and (1-) 3-5 mm wide, cuneate-obovate, incised at the apex, upper side covered sparsely with subappressed hairs or nearly glabrous, lower side more densely hairy, often folded upwards. Inflorescences with a peduncle 0,5-5 (-7) cm long, covered with short patent or appressed hairs, with 2-6 flowers in a crowded head, sometimes with a second whorl of flowers in some distance from the terminal one. Bracts membraneous, ca. 0.5 mm long, narrowly triangular. Flowers with a very short

pedicel. Calyx 2,5-3 mm long, campanulate, loosely hairy, with subulate teeth o,5-1,2 mm long. Corolla yellow with pink top of the keel. Standard 5-7 mm long, ca. 2,5 mm broad, narrowly elliptic with slightly retuse apex. Wings 4,5-6 mm long; limb narrowly oblong, slightly obliquely retuse at the apex, 3-4 mm long and ca. 1,2 mm broad; auricle ca. 0,8 mm long, claw 1-2 mm long. Keel 4-4,5 mm long; limb oblique-obovate, with lower edge in apical part broadly bent and upper edge nearly straight, 2-2,5 mm long and 1,3-1,5 mm broad, auricle very short, claw ca. 2 mm long. Staminal tube ± straightly cut. Ovary sessile, glabrous; style short. Legume nearly sessile, ± erect, narrowly ovate with rounded base and a long acuminate beak, 10-16 mm long, 3-4 mm high and 2-3 mm wide, sharply keeled on ventral side, deeply and narrowly V-shaped grooved, valves with fine transverse nerves, covered with very short patent or appressed hairs or glabrous. Pod opening at ventral suture, with septum ca. 2 mm broad but completely bilocular by the deeply intruding dorsal groove. Seeds 3-4 in each locule, 3-3,2 mm long and ca. 2 mm broad, brown, smooth.
Flowering time: IV-VI. **Occurence:** dry steppe regions, ascending up to 2700 m.
Distribution: Iran, Afghanistan. Map 5.

The species can be separated into two subspecies according to the different type of indumentum:

4a. Astragalus coronilla Bunge subsp. coronilla (Type as in species)

Hairs in all parts of the plant ± patent.

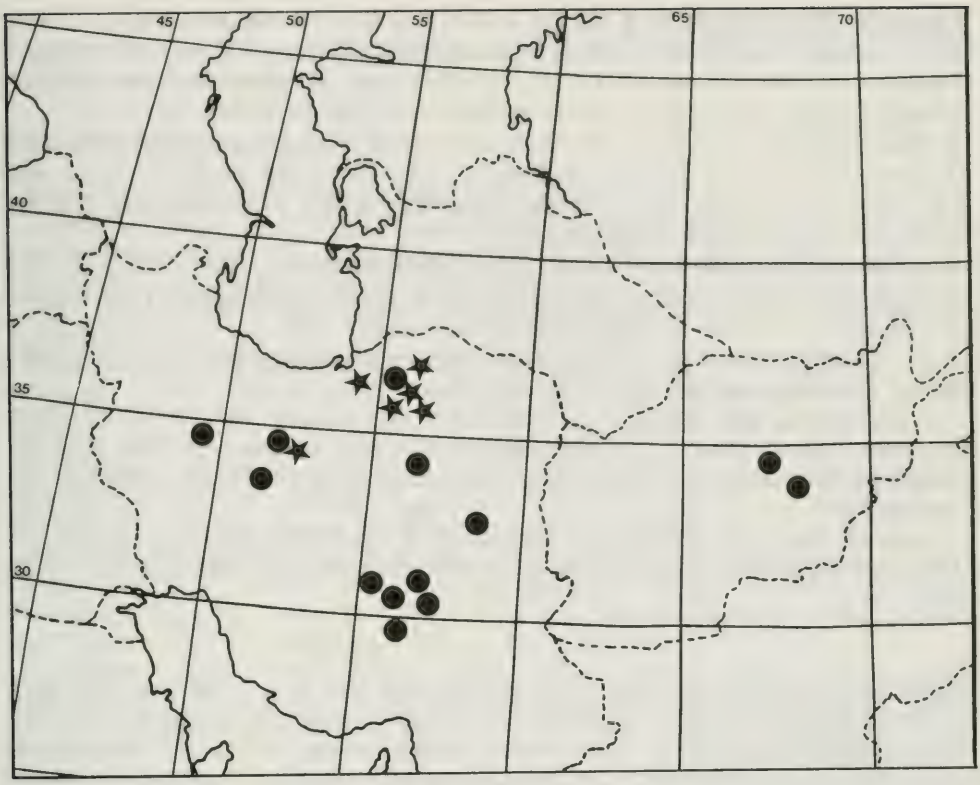
Specimens seen:

Iran. Prov. Tehran: Mobarakiyeh, 40 km S Veramin, 900 m, 22.5.1974, *Rechinger 46129* (W). -- Prov. Semnan: inter Maiomai et Shahrud, 13.6.1948, *Rechinger & al. 5315* (W). -- Prov. Khorasan: Kuh-e Nishapur, Darreh Abshar supra Akhlomat, 1600-1800 m, 30.5.1948, *Rechinger & AEllen 4480 pp.* (W) - 70 km SW Torbat-e Heydariyeh inter Jannatabad et Alui, 8.5.1975 (W) - Tabas, Shirgasht, 26.4.1964, *Ruttner 564* (W) - Sser Tschah, V.1859, *Bunge* (G-BOIS, K, P, W). -- Prov. Lorestan: 55 km from Arak to Malayer, 2100 m, 15.6.1984, *Mozzafarian & Maassoumi 48084* (TARI, Hb. PODL.). - - Prov. Esfahan: Isfahan, *Aucher-Eloy 4440 pp.* (BM, P, W) - 24 km NE Murcheh Khvort, 1750 m, 27.5.1974, *Rechinger 46629* (W). -- Prov. Yazd: ? Prov. Djandak - Biyabanak (S der Großen Kavir), bei Hauz Patil, 800 m, 28.4.1933, *Gabriel 88* (W). -- Prov. Kerman: inter Yezd et Kerman, inter Anar et Bahramabad (Rafsindjan), 22.4.1948, *Rechinger & al. 2859* (W) - inter Kerman et Bagh, 18.4. 1859, *Bunge & Bienert* (P) - inter Kerman et Saidabad (Sirdjan), 27.4. 1948, *Rechinger & al. 3034b* (W) - dto., inter Baghin et jugum Sangpur, ca. 2200 m, 27.4.1948, *Rechinger & al. 3081* (W). -- Nicht genau lokalisierbar: Säkesi (Säg-si), *Bunge* (P).

Afghanistan. Prov. Bamian: Paimuri gorge, 2700 m, 27.6.1962, *Hedge & Wendelbo W.4701 pp.* (BG). -- Prov. Maidan: an der Straße Kabul-Ghazni, 4 km N der Brücke über den Wardak-Fluß, 2120 m, 19.5.1978, *Podlech 31150 a* (Hb. PODL.).

4b. Astragalus coronilla Bunge subsp. semnanicus Gazer & Podlech subsp. nov. **Holotype**: Persia, Shahrud-Bustam, Turan protected area, in arenosis 28-30 km ESE Delbar versus Ahmadabad, 35°46' N - 56°36' E, 800 m, 28.4.1975, *K.H.Rechinger 50581* (W!; Iso: B!, G!)

differt ab *A. coronilla* subsp. *coronilla* indumento in omnibus partibus plantarum e pilis arcte appressis consistente.



Map 5. Distribution of *Astragalus coronilla*
● subsp. *coronilla*, ✶ subsp. *semnanicus*

Hairs in all parts of the plants appressed. Flowers mostly somewhat shorter than in the type subspecies.

Specimens seen:

Iran. Prov. Semnan: Kavir protected area, 2 km on the road NW gate to Shah Abbas Karavanserai, 850 m, 5.5.1976, *Runemark & al. 19435* (TARI) - 82 km from Sabzevar to Mayamey, before Abbasabad, 930 m, 29.4.1986, *Assadi & Maassoumi 55895* (TARI) - Turan protected Area, 28-30 km ESE Delbar versus Ahmadabad, 800 m, 28.4.1975, *Rechinger 50581* (B, G) - Touran Protected Area, 1 km Sw of Chejam, 1095 m, 23.4.1978, *Freitag 14679* (B). -- Prov. Kerman: inter Yezd et Kerman, inter Bahrambad et Kabutarkhan, 22.-23.4.1948, *Rechinger & al. 2909* (W) - inter Saidabad (Sirdjan) et jugum Chah Choghuk, 1700-1900 m., 28.4.1948, *Rechinger & al. 3169* (B, W).

The following specimen "Iran. Prov. Azerbaidjan-e-Gharbi: 10 km E Maku on road to Marand, 1200 m, 5.5.1971, *Lamond 2695* (M)" is clearly intermediate between the two subspecies in respect of the direction of the hairs.

5. **Astragalus filicaulis Karelin & Kirilov** in Bull. Soc. Imp. Naturalistes Moscou 15: 336. 1842. **Syntypes:** In littore orientali m. Caspii, *Karelin 256*; in apricis montium Arganaty, Songoriae, VI.1841, *Karelin & Kirilov 262*. **Lectotype**: in apricis montium Arganaty, Songoriae, *Karelin & Kirilov 262* (other isotypes were distributed as no. *1388*: G!, P!)

= *A. filicaulis* Ledeb., Fl. Ross. 1: 637. 1843, nom. superfl. ≡ *Tragacantha filicaulis* (Ledeb.) O.Kuntze, Revis. Gen. 2: 944. 1891 ≡ *Oxyglottis filicaulis* (Ledeb.)Nevski in Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssh. Rast. 4: 259. 1937. **Syntypes:** In littore orientali m. caspii, *Karelin; Lessing* (not seen).

= *A. rytilobus* Bunge in Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26 (2): 209. 1880 ≡ *A. filicaulis* subsp. *rytilobus* (Bunge)M.Popov in Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 3: 48. 1928. **Syntypes:** different Syntypes (not seen).

= *A. leptodermus* Bunge in Izv. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26(2): 210. 1880. **Typus:** Turkestan, near Jarbascha, *Fedtschenko* (non vidi).

= *A. nawabianus* Aitch. & Baker in Trans. Linn. Soc. London, Bot. 3 (1): 49. 1888. **Syntypes:** Harirud valley, 12.4.1885, *Aitchison 1044* (P!); Badghis, 14.5.1885, *Aitchison*. **Lectotype** (here designated): [Afghanistan] Harirud valley, 12.4.1885, *Aitchison 1044* (K!; Iso: G!, P!).

= *A. agrestis* Freyn in Bull. Herb. Boissier, sér. 2, 4: 446. 1904, nom. illeg. non Hooker. **Lectotype** (here designated): Aschabad, 7.5.1900, *Sintenis 158a* (LD!; Iso: B!, G!, K!, LD!).

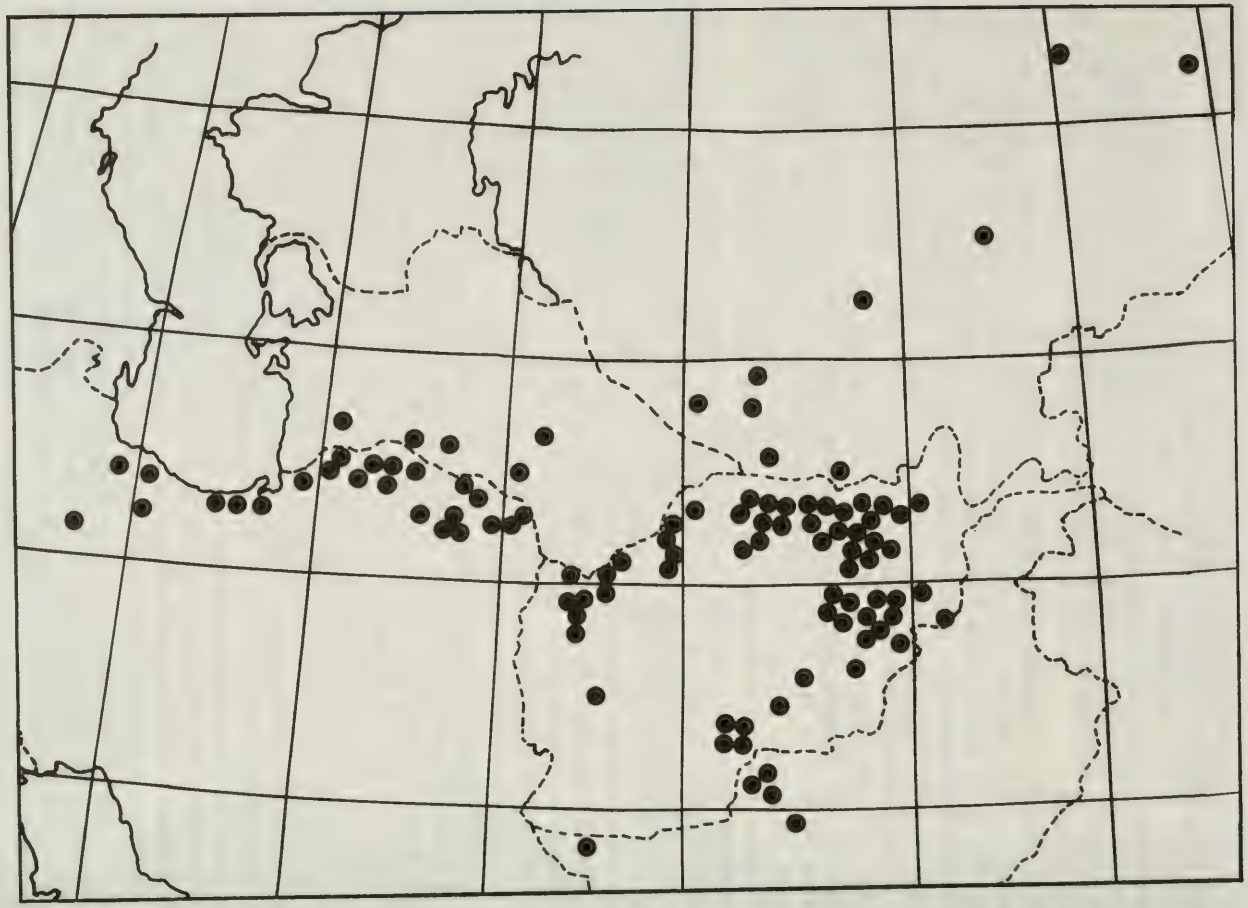
Plants annual, branched at the base, covered with thin, soft, 0,3-1,6 mm long white hairs, near and on the stipules and in the inflorescence also with black hairs. Stems 8-27 cm long, erect or prostrate to ascending, finely sulcate, sparsely covered with 0,3-1,1 mm long appressed hairs. Stipules pale green, 2,5-4 mm long, narrowly triangular, acuminate, very shortly adnate to the petiole, otherwise free, white or white and black ciliate. Leaves 5-8 cm long, petiole 0,5-1,2 cm long, like the rachis sparsely covered with subappressed hairs. Leaflets 5-7 paired, 2-9 (-13) mm long and 1-2,8 mm broad, narrowly elliptical or narrowly oblong, obtuse or slightly retuse at the apex, covered on both sides with 0,6-1,6 mm long subappressed hairs, on the lower side more densely hairy than in the upper. Inflorescences with a peduncle 1,5-6 cm long, covered with up to 1 mm long white or in upper part with scattered black ± appressed hairs, with 3-9 flowers in an crowded head. Bracts 1-1,5 mm long, hyaline, lanceolate acute, white or black and white ciliated. Pedicels ca. o,5 mm long, white hairy. Calyx 3-4 mm long, campanulate, covered at base mainly with white appressed hairs, toward the teeth with more patent and more black hairs, teeth subulate 1,8-2 mm long. Corolla violet. Standard 6-8 mm long and 2-2,5 mm broad, narrowly elliptic-oblong, distinctly and broadly retuse at the apex, very shortly narrowed at the base. Wings 4,5-5 mm long, limb narrowly oblong, obliquely incised at the apex or sometimes nearly rounded, ca. 3 mm long and 1 mm broad, auricle 0,6-0,8 mm long, claw 1,8-2 mm long. Keel 3,5-4 mm long, limb obliquely obovate, with lower edge strongly bent and upper edge slightly curved, ca. 2 mm long and 1,2 mm broad; auricle indistinct, claw 1,5 - 2 mm long. Staminal tube cut at right angle. Ovary sessile, hairy; Style short, glabrous. Legumes sessile, stellately arranged or more deflexed, oblong to narrowly ovate, 6-7 (-10) mm long, 3,5-4 mm high and ca. 3 mm broad, somewhat widened at the base, slightly carinate ventrally and deeply grooved dorsally, with a short beak, valves thin, wrinkled, covered loosely with two kind of hairs (double indumentum): short, subadpressed 0,1-0,3 mm long hairs and up to 1,5 mm long patent hairs. Pod opening at the ventral suture, semibilocular, with a septum 1/2 - 2/3 of the pod's high. Seeds 2-3 in each locule, 1,2-1,5 mm long and 1-1,2 mm broad, brown.

Flowering time: (III) IV-VI. **Occurence:** Steppes and semidesert places on all kind of soils,

from the plains up to 3150 m.
Distribution: Kazakhstan, Turkmenistan, Uzbekistan, Tadzhikistan, Kirghizia, Iran, Afghanistan, Pakistan. Map 6.

Specimens seen:

Russia. Prov. Tschkalov: Orenburg [= Tschkalov], *Regel 249* (P).
Kazakhstan. Prov. Kzyl-Ordinsk: Ozero [Lake] Tajljak-Kul, Systema Sary-Su, 19.5.1914, *Krascheninnikov 18* (G). -- Prov. Taldy-Kurgan: in apricis montium Arganaty Songoriae, 1841, *Karelin & Kirilov 1388* (G, P). -- Prov. Alma-Ata: Kitschkilenn (near Ili), 16.-17.6.1895, *Chaffanjon 699, 702, 715* (P) - rami septentrionali jugi Kirghizici in viciniis pag. Logovoje, 10.6.1963, *Goloskokov* in Herb. Fl. SSSR *4472* (W).
Turkmenistan. Prov. Ashkhabad: Kisil Arwat, 1883, *Becker* (G) - dto., 5.5.1901, *Sintenis 1650* (B) - Ashkhabad, 3.5.1898, *Litwinow 1292* (W) - dto., 15.4.1898, *Litwinow 1291* (BG, W) - dto., 7.5. 1900, *Sintenis 158a* (B, G, K, P) - dto., 1.5.1943, *Kultiassov* (W) - dto., supra Nephton, 4.5.1900, *Sintenis 244a* (BM, G, K) - Gaudan, 30.5.1898, *Litwinow 1294* (W) - dto., 1200 m, 10.6.1974, *Nikitin & Ivanov* (BM, G, K, MA, W) - inter Annaju et Gjaurs, 26.5.1900, *Sintenis 158b* (B) - 20 km E Ashkhabad prope Giaurs, 200 m, 28.4.1979, *Belianina & Sofeikova* in Soc. exch. pl. vasc. Eur. occ. Bassin médit. *9336* (Hb. PODL.) - by river Tedshen near Karry-bent, 8.4.1898, *Litwinow* (G).
Uzbekistan. Prov. Tashkent: in collo argillosi in urbe Taschkent, 20.5.1925, *Vvedensky* in Herb. Fl. As. Mediae *386* (B, G, K, MA, P, W). -- Prov. Samarkand: Samarkand, 22. 5.1897, *Lipsky* (B, G) - S Samarkand, Jangi Aryk, 700 m, 22.5.1974, *Vasák* (W). -- Prov. Kashka-Darinsk: Distr. Schirabad, locus Tiwak-tau, 13.4.1906, *Roshewitz* in Edit. Bot. Hort. Imp. Petrop. *17* (B, BM, G).
Tadzhikistan: jugum Chodzha-Kazjan. declive orientale montis Ustymtau, 700 m, 1.4.1976, *Kinzikaeva & Koczkareva* in Herb. Fl. Tadzhik. *63* (K, W). -- Prov. Kuljab: Bald-shuan, *Regel* (B).
Iran. Prov. Zanjan: Sultanabad near Kasvin, V.1935, *Lindsay 188* (BM). -- Prov. Gilan: Mendschil inter Resht et Tehran, 11.5.1902, *Bornmüller 6709* (B). -- Prov. Mazanderan (Gorgan): Dasht-e Gorgan, 3.5.1948, *Sharif 125* (W) - Ghombad Ghabus, Marli, 6.5.1956, *Sharif 5209-E* (W) - Gonbad Ghabus, Gharemachar, 26.4.1956, *Sharif 5229-E* (W) - Gonbad, Korand, 10.5.1959, *Mirzogan 5292-E* (W) - 50 km from Inche-Boroon to Maravetappeh, 160 m, 21.4.1986, *Assadi & Maassoumi 55405* (TARI) - 26 km from Inche-Boroon to Maraveteppah, 110 m, 21.4.1986, *Assadi & Maassoumi 55373* (TARI, Hb. PODL.) - Jangal-e Golestan, Dasht-e Calpush, 920-1000 m, 21.5.1976, *Termeh & Matin* (W). -- Prov. Khorasan: 72 km from Maravetappeh to Ashkhaneh, near Garmab, 680 m, 24.4.1986, *Assadi & Maassoumi 55628* (TARI; Hb. PODL.) - 15 km from Bojnoord to Gifan, near Soorek, 20.5.1984, *Assadi & Maassoumi 50084, 50168* (TARI) - 6 km E Bojnurd, 1020 m, 15.5.1966, *Pabot 12741-E* (W) - 12 km from Shirvan on road to Bojnoord, 30.5.1984, *Assadi & Maassoumi 50862, 50867* (TARI, Hb. PODL.) - inter Djenaran et Kuchan, 1200-1300 m, 2.4.1948, *Rechinger & al. 4751* (B, G, K, W) - 11 km from Lotfabad to Kalat-e Naderi, 400 m, 26.4.1986, *Assadi & Maassoumi 55693* (TARI, Hb. PODL.) - ca. 25 km SW Darreh-Gaz, Tandooreh National Park, Che-hel-Mehr, 1200 m, 29.5.1984, *Assadi & Maassoumi 50762* (TARI) - Montes Hazar Masdjid, inter Ardak et Tolgor, 1200-1600 m, 7.-10.6.1948, *Rechinger & al. 4954* (W) - Haresabad S Sabzavar, 940 m, 1.5.1976, *Reyamand & Bazar-gan 31758* (W) - 55 km E Sabzevar, 1240 m, 25.3.1976, *Reyamand & Bazargan 31716* (W) - 15 km a bifurcatione viae Mashhad - Sarakhs versus Salehabad, 700-900 m, 26.5.1977, *Rechinger 55769* (W) - Sarakhs, Cheshmehshur, 490 m, 21.5. 1972, *Foroughi 6047* (TARI) - Kuh-e Nishapur, Darreh Ab-shar supra Akhlomat, 1600-1800 m, 30.5.1948, *Rechinger & al. 4557a* (W) - 60 miles SE Mashhad, 17.4.1964, *Furse 5301* (K). -- Prov. Hamadan: in agro Ecbatanensi [= Hama-dan], 1882, *Pichler* (B, K) - in monte Elwend, VI.1902, *Strauss* (B). -- Prov. Esfahan: N Muteh (Mooteh), 2100-2450 m, 31.5.1974, *Rechinger 46990* (W). -- Prov. Khuzestan: Abadan, IV.1927, *Macmillan 113* (K). - - Prov. Fars: Maharlu, 5.4.1936, *Gauba 938* (B).
Afghanistan. Prov. Herat: N'Hang des Kotal-i-Mirza an der Straße von Herat nach Toraghundi, 1250-1350 m, 29.4. 1977, *Podlech & Jarmal 29527* (M, Hb. PODL.) - Herat, 1000 m, 29.4.1949, *Köie 4305* (W) - 15 km E Herat, 25.4.1971, Gibbons 132 (K) - 18 km E Herat an der Straße nach Obeh, 980 m, 30.4.1977, *Podlech & Jarmal 29580* (Hb. PODL.) - near top of Kotal-e Mir Ali, 1680, m, 8.5.1969,



Map 6. Distribution of *Astragalus filicaulis*

Hedge & al. W.7733 (GB, Hb. PODL.) - dto., *Kukkonen 5920* (H) - dto., *Uotila 16374* (H) - Haririud valley, 12.4.1885, *Aitchison 1044* (G, K, P). -- Prov. Badghis: Yaka Tut, 20 km S Toraghundi, 800 m, 29.4.1977, *Podlech & Jarmal 29494, 29517* (M, Hb. PODL.) - Khush Asia, Khaleqdad, 900 m, V. 1969, *Janata 42* (W) - Chapchal Tal 7 km E Sakza'i an der neuen Straße nach Ghormach, 430 m, 6.5.1977, *Podlech & Jarmal 29906* (M, Hb. PODL.) - 5 km N Mukur Arbab Aziz, an der Straße von Qala-i-Naw nach Bala-Murghab, 880 m, 5.5.1977, *Podlech & Jarmal 29873* (Hb. PODL.) - Darrah-e-Bum, 900 m, 15.5.1970, *Carter 861* (K) - Qala Nau, 1.4. 1949, *Köie 3883* (W) - dto., 980 m, 4.5.1977, *Podlech & Jarmal 29859* (Hb. PODL.). -- Prov. Faryab: 7 km E Dawlatabad an der Piste nach Sheberghan, 420 m,23.4.1971, *Podlech 20612* (Hb. PODL.) - Dasht-i-Laili, midway from Dawlatabad to Sheberghan, 450 m, 27.5.1969, *Hedge & al. W.8434* (GB) - Kohna Qala, 27 km N Maymana an der Straße nach Dawlatabad, 660 m, 25.4.1971, *Podlech 20803* (Hb. PODL.) - 14 km NE Maymana an der Straße nach Dawlatabad, 900 m, 23.4.1971, *Podlech 20648* (Hb. PODL.) - Kata Qala, 27 km E Maymana gegen Belcheragh, 900 m, 24.4.1971, *Podlech 20676* (Hb. PODL.). -- Prov. Jawz Jan: Dasht-i-Laili, 22 km WSW Sheberghan gegen Dawlatabad, 450 m, 23.4.1971, *Podlech 20576* (Hb. PODL.) - 7 km W Sheberghan gegen Dawlatabad, 400 m, 23.4.1971, *Podlech 20561* (Hb. PODL.) - Jalalabad, 18 km NE Sheberghan, 320 m, 26.4. 1971, *Podlech 20873* (Hb. PODL.) - 8 km SW Aqcha gegen Sheberghan, 320 m, 22.4.1971, *Podlech 20555, 22388* (Hb. PODL.) - 5 km NE Faizabad an der Straße von Aqcha nach Balkh, 305 m, 26.4.1971, *Podlech 20882* (Hb. PODL.). -- Prov. Balkh: Mamalik, 34 km WNW Balkh gegen Aqcha, 320 m, 22.4.1971, *Podlech 20549* (Hb. PODL.) - Rabat-i-Payn, ca. 15 km S Balkh, 430 m, *Uotila 16920* (H) - 16 km S Pul-e Imambukri, 600 m, 21.3.1968, *Breckle 947* (Hb. BRECKLE) - Koh-i-Elburz Mts, 30 miles SW of Mazar-i-Sharif, 762 m, 13.5.1969, *Hewer 1096* (K) - Chashmeh-i-Shafa, in faucibus fluvii Balkh, 500 m, 9.5.1967, *Rechinger 34098* (W) - dto., *Kukkonen 6470 pp* (H) - Alakajar, ca. 35 km S Balkh, 520 m, *Kukkonen 6354* (H) & *Uotila 16932* (H) - Qurbaqqa, an der Straße von Balkh nach Aq Kupruk, 550 m, 10.5.1978, *Podlech 30906* (Hb. PODL.) - 4 km S Tash Kanda an der Straße nach Aq Kupruk, 600 m, 10.5.1978, *Podlech 30914* (Hb. PODL.) - 2 km N Khairabad, ca. 30 km N Mazar-i-Sharif, 310 m, *Kukkonen 6286* (H) - in faucibus 20-25 km SE Mazar-i-Sharif, 500-700 m, 9.5.1967, *Rechinger 34151* (W) - 20 km E Mazar-i-Sharif gegen Tashqurghan, 370 m, 22.4.1971, *Podlech 20536* (Hb. PODL.). -- Prov. Samangan: 18 km E Tashqurghan, 10.5.1967, *Rechinger 34235* (W) - 54 km E Tashqurghan dans la Dasht-i-Mir Alam, 7 km WNW Khoyr-Abad, 340 m, 29.4.1966, *Lalande R.55* (Hb. PODL.) - 5 km S Tashqurghan, 500 m, 27.4.1971, *Podlech 20966* (Hb. PODL.) - 12 km SE Tashqurghan gegen Aybak, 550 m, 27.4. 1971, *Podlech 20984* (Hb. PODL.) - 21 km SE Tashqurghan versus Haibak, 600 m, 7.5.1967, *Rechinger 34058* (W) - Tasht-i-Rostam prope Haibak, 1200 m, 7.5.1967, *Rechinger 33987* (W) - Aybak, 950 m, *Uotila 16773* (H) - 28 km E Aybak, 1280 m, *Kukkonen 6404* (H). -- Prov. Qunduz: Surkh-ab Tal 33 km S Qunduz versus Baghlan, 500 m, 11.5.1967, *Rechinger 34324* (W) - 4 km S Aliabad, 500 m, 8.5.1971, *Podlech 21277* (Hb. PODL.) - 9 km SW Khanabad an der Straße nach Aliabad, 520 m, 7.5.1971, *Podlech 21246* (Hb. PODL.) - Sanduqsay, 600 m, 2.5.1971, *Anders 6100* (Hb. PODL.) - Qunduz Tal bei Qezel Say, 600 m, 2.5.1971, *Anders 6104, 6127* (Hb. PODL.). -- Prov. Takhar: Khanabad, 20.5.1938, *Meinertzhagen* (BM) - Eshanan, 22 km E Khanabad gegen Taulqan, 720 m, 26.4.1965, *Podlech 10246a* (Hb. PODL.) - Taluqan, 720 m, 7.5.1965, *Podlech 10451* (Hb. PODL.) - Khatayan, an der Straße von Taluqan nach Farkhar, 950 m, 30.4.1971, *Anders 5915, 5985* (Hb. PODL.) - Farkhar Tal bei Farkhar, 1250 m, 9.5.1965, *Podlech 10530* (Hb. PODL.) - dto., 25.5.1972, *Anders 9136* (Hb. PODL.) - dto., 13.5.1977, *Podlech & Jarmal 30120* (Hb. PODL.) - dto., Hänge SW des Ortes, 1400-1650 m, 14.5.1977, *Podlech & Jarmal 30206* (M, Hb. PODL.) - Farkhar Tal 4 km oberhalb Farkhar, 1300 m, 9.5.1965, *Podlech 10500* (Hb. PODL.). -- Prov. Badakhshan: above Keshem, 6000', 7.6.1971, *Gibbons 786* (K). -- Prov. Baghlan: Baghlan Tal bei Jelaw Gir, 600 m, 29.4.1971, *Anders 5864a* (Hb. PODL.) - 4 km E Baghlan gegen Narin, 630 m, 6.5.1971, *Podlech 21125* (Hb. PODL.) - 5 km E Rabatak an der Straße von Pul-i-khumri nach Aybak, 750 m, 27.4.1971, *Podlech 21020* (Hb. PODL.) . inter Pul-i-khumri et Ribat [Rabatak], 700-1200 m, 5.5.1967, *Rechinger 33828, 33862* (W) - Pul-i-Khumri, 750 m, 17.4. 1971, *Anders 5593* (Hb. PODL.) - 10 km S Pul-i-khumri, 700 m, 4.5.1967, *Rechinger 33664* (W) - Dasht-e-Layeqa, 16 km SSE Pul-i-khumri an der Straße nach Doshi, 780 m, 27.4. 1971, *Podlech 21042* (Hb. PODL.) - 25 km S Pul-i-khumri, Surkhab Tal, 4.5.1967, *Rechinger 33744, 33757* (W) - 1 km W Doshi on road to Bamian, 900 m, *Kukkonen 6470 pp* (H) - 8 km W Khenjan, 1000 m, *Kukkonen 6078* (H) - Andarab Tal 4 km E Khinjan, 1150 m, 24.5.1968, *Freitag*

2784 (Hb. FREITAG) - Andarab Tal bei Dahan-i-Badga, 1250 m, 11.6.1965, *Podlech 11283* (M, Hb. PODL.) - Andarab Tal zwischen Kush-darrah und Mushi, ca. 1300 m, 11.6.1965, *Podlech 11291* (M, Hb. PODL.) - Andarab Tal, Deh Salah. 1600 m, 1.6. 1965, *Podlech 10988* (Hb. PODL.). -- Prov. Parwan: Ghor-band Tal, 2 km E Alaqadari Sekh'Ali, 2200 m, 13.5.1970, *Podlech 18010* (Hb. PODL.). - - Prov. Bamian: Band-i-Amir, 2900 m, 16.7.1962, *Rechinger 18497*(W) - dto., 30.7.1965, *Podlech 12110* (Hb. PODL.) - dto., 1970, *Dieterle 872* (Hb. PODL.) - dto., Surkh Petau zwischen See und Kohe Jak Ruya, 3150 m, 24.5.1971, *Dieterle 1133* (Hb. PODL.) - dto., "Dasht-i-Menaband", 3000 m, 1970, *Dieterle 933* (Hb. PODL.) - dto., Jarkushan, 2900 m, 4.6.1971, *Dieterle 1181* (Hb. PODL.) - Erak, 1851, *Griffith* (G-BOIS). -- Prov. Kabul: westlich Kabul, 30.5.1950, *Volk 328* (W) - Kabul, Aliabad, 16.5.1951, *Neubauer 101* (W) - Kabul, Aliabad-Berg, 2000 m, 13.5.1950, *Volk 14 = 1562* (W) - Kabul, Sher Darwasa, 9.5.1951, *Neubauer 59* (W) - dto., 17.5.1967, *Breckle 339* (Hb. BRECEKLE) - Kabul, Karte Tschahar, 30.5. 1950, *Neubauer 595* (W) - 2 km E des Flughafens Kabul, 1850 m, 29.4.1970, *Podlech 17713* (Hb. PODL.) - 20 km E Kabul, 1800 m, 12.5.1967, *Rechinger 34335* (W) - 30 km E Kabul gegen Sarobi, 1750 m, 20.5. 1969, *Breckle 1801* (Hb. BRECKLE, Hb. PODL.) - Sarobi, 12.5.1951, *Volk 1901* (W) - Kabul Tal (Darrah-i-Maidan) 22 km SW Kabul bei Karez, 1950 m, 20.5.1977, *Podlech 30405* (M, Hb. PODL.). -- Prov. Maidan: Siah Sang prope Fara-kulum, ad fluvium Helmand, 2900 m, 20.6.1967, *Rechinger 36077* (W) - an der Straße von Kabul nach Ghazni, 4 km N der Brücke über den Wardak Fluß, 2120 m, 19.5.1978, *Podlech 31137* (Hb. PODL.). -- Prov. Logar: 12 km SE Baraki Barak, Belak Dag, 6 km S Darwesh, 2040 m, 23.5.1966, *Lalande R.210-S.33* (Hb. PODL.) - 6 km E Pul-Alam an der Straße nach Khoshi, 2000 m, 19.5.1978, *Podlech 31210* (G, M, Hb. PODL.) - 12 km S Pul-Alam gegen Gardez, 2110 m, 23.5.1977, *Podlech 30434* (Hb. PODL.) - vallis Logar 50 km N Gardez, 2000 m, 2.6. 1967, *Rechinger 35384* (W) - 4 km E Shashqala gegen Altimur, 2100 m, 30.5.1978, *Podlech 31382* (Hb. PODL.). -- Prov. Ghazni: Alaqadari Yosufkhel, 2200 m, 8.5.1949, *Neubauer 1236a* (W, Hb. PODL.) - 20 km N Mukur, 2130 m, *Hedge & al. W.7606* (GB). -- Prov. Paktia: Tera Farm N Gardez, 2300 m, 25.6.1971, *Volk 71/432c* (Hb. PODL.) - Khost, 1200 m, 13.5.1972, *Anders 9002a* (Hb. PODL.). -- Prov. Orozgan: 42 km S Tirin versus Kandahar, 1800 m, 23.5.1967, *Rechinger 35055* (W). -- Prov. Zabul: Qalat [i-Ghilzai], 10.4.1958, *Lindberg 369* (W). -- Prov. Kandahar: inter lacum artificiale "Arghandab reservoire" et Tirin, 1400-1700 m, 23.5.1967, *Rechinger 35000* (W) - 43 km N Kandahar versus lacum artificiale "Arghandab reservoire", 1100-1200 m, 22.-23.5.1967, *Rechinger 34893* (W) - bei Dabare, an der Straße Kandahar - Spin Boldak, 1160 m, 22.4.1972, *Anders 8745* (Hb. PODL.) - 12 km NW Spin Boldak, N'Hänge Takht Ghar, 1225 m, 1.5.1967, *Lalande R.838* (Hb. PODL.) - 2 km NW Spin Boldak, 1200 m, 21.4.1972, *Anders 8703* (Hb. PODL.). -- Prov. Farah: Farah to Dila-ram, 24.4.1964, *Furse 5545* (K).

Pakistan. Khyber: Khyber Pass, 13.4.1897, *Johnston* (K) - Landi Kotal, 3500', *Lowndes L.717* (E). -- Quetta: in jugo Bolan, 2000 m, 23.4.1965, *Rechinger 28420* (W) - prope Quetta. 1800-1900 m, 11.5.1965, *Rechinger 29226, 29227* (W). -- Kalat: 40 km N Kalat versus Mastung, 22.4. 1965, *Rechinger 28371* (W) - near Sultan, Maslakh Range, 5000', V.1957, *Stewart 28006* (K).

6. Astragalus geniculatus Desf., Fl. Atl. 2: 186. 1799 ≡ *Tragacantha geniculata* (Desf.)O.Kuntze, Revis. Gen.: 945. 1891. **Holotype:** in collibus incultis et aridis prope Mascar, *Desfontaines* (P-Desf!)

= *A. geniculatus* f. *pallidus* Maire & Weiller in Bull. Soc. Hist. Nat. Afr. Nord 31: 17. 1940. **Type:** Maroc oriental, steppes d'alfa de la Haute Moulouya entre Tounfit et Midelt, *Maire & Weiller 814* (not seen).

Fig.: DESFONTAINES, Flora Atlantica 2: tab. 205. 1799.

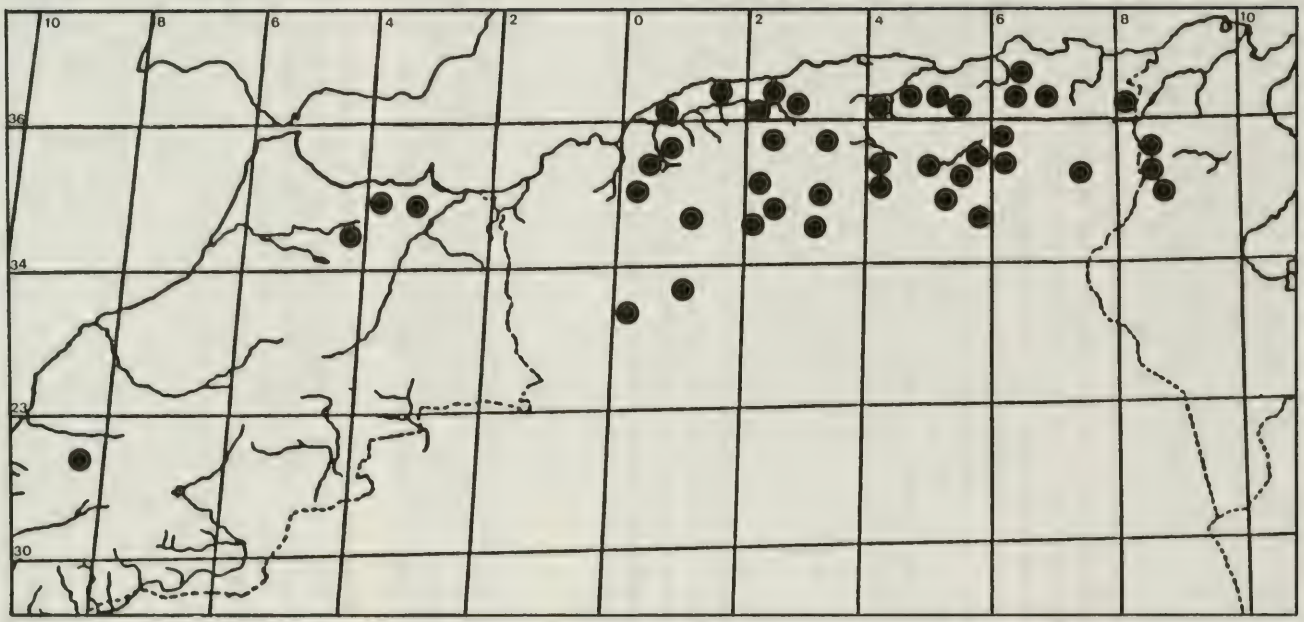
Plants branched at the base, covered with appressed to semipatent (on the fruit also patent) 0,5-2,3 mm long white hairs, at the stipules and in the inflorescence also with black hairs. Stems absent or up to 20 cm long, prostrate or ascending, rather densely covered with appressed to semipatent, 0,6-1,5 mm long hairs, the density of hairs increases toward the nodes. Stipules

green, 3,5-5 mm long, narrowly triangular, long acuminate, adnate at the length of 0,8-1,3 mm to the petiole, otherwise free, white and black hairy. Leaves 2-5,5 cm long; petiole indistinct, like the rachis rather densely covered with 0,6-1,1 mm long white and sometimes scattered black hairs. Leaflets (6-) 7-10 paired, (3-) 4-10 mm long and 1,5-4 mm broad, narrowly oblong to narrowly elliptic, obtuse or slightly retuse at the apex, both sides sericeous with subappressed white hairs, lower side mostly more densely hairy than upper. Inflorescences with a peduncle 1,5-5 cm long, with appressed to semipatent white or sometimes also scattered black hairs, with 2-6 flowers in a dense head, mostly stellately arranged. Bracts membraneous, 1-3 mm long, narrowly triangular, white and black ciliate. Flowers sessile. Calyx ca. 6 mm long, campanulate, covered loosely to rather densely with appressed, 0,6-1,2 mm long white hairs, toward the teeth with somewhat longer and also black hairs; teeth subulate, 2-2,5 mm long. Corolla white or pinkish. Standard 8,5-12 mm long and 3,5-5 mm broad, elliptic, retuse at the apex. Wings 7-9 mm long, the limb narrowly oblong, bilobed at the apex, 3-5 mm long and 1-1,5 mm wide; auricle 0,5-0,8 mm long, claw 3-3,5 mm long. Keel ca. 6 mm long, the limb triangular-obovate, with lower edge strongly curved and upper edge slightly curved, obtuse at the apex, ca. 3 mm long and 1,5-1,8 mm broad; auricle very short, claw ca. 3 mm long. Staminal tube cut straightly. Ovary sessile, hairy; style short, glabrous. Legumes sessile, obliquely narrowly oblong, slightly curved on the ventral side and strongly curved on the dorsal side, rounded at the base, narrowed toward the apex into a 2-3,5 mm long slightly to distinctly recurved beak, 12-16 (-19) mm long, 3,5-4,5 mm high and ca. 2,5-3 mm broad, strongly carinate at the ventral side, deeply and narrowly grooved at the dorsal side, the groove distinctly widened towards the base of the fruit; valves thin, nearly flat, covered with two kinds of hairs (double indumentum): with short, adpressed or subadpressed 0,1-0,2 mm long hairs and with semipatent to patent up to 2,3 mm long hairs. Pod opening at the ventral suture, with a septum ca. 1,5 mm broad, but fully bilocular because of the deeply intruding dorsal groove. Seeds 3-5 in each locule, 2-3 mm long and 2-2,5 mm broad, brown, smooth.
Flowering time: IV-V. **Occurence:** in steppe places, from the plains up to 1500 m.
Distribution: Morocco, Algeria, Tunesia. Map 7.

Specimens seen:

Morocco. Prov. Taza: Nador de Ain-Zora, 1250 m, 1.5. 1934, *Sennen & Mauricio* in SENNEN, Pl. d'Esp. *9350* (BM, MA, MPU, W) - Metalza, Ain-Zora, 1250 m, 26.5.1933, *Sennen & Mauricio* in SENNEN, Pl. d'Esp. *8774* (BM, MA, MPU, W) - Oued Termas N de Taza, 24.5.1929, *Jahandiez 276* (BM, MA, MPU). -- Prov. Marrakech: 61 km from Marrakech to Chichaoua, 350 m, 16.3.1969, *Davis 48276* (BM).

Algeria. Wil. Tlemcen: Gar Rouban, *Pomel* (MPU) - Sidi-Yaccub, Massif de Ghar Rouban, 3.6.1936, *Faurel* (MPU) - Sebdou, 21.4.1856, *Cosson* (P). -- Wil. Oran: Oran, 29.4. 1880, *Debeaux* (MA). -- Wil. Sidi-Bel-Abbès: Daya, V.1863, *Lefrane* (P). -- Wil. Mostaganem: Relizane, *Battandier* (MPU). -- Wil. Saïda: Tirfit près Saïda, 6.6.1936, leg. ? (MPU) - entre Benian et Oulad Krahd Garabas, 20.5.1852, *Cosson* (P) - Geryville ([= El Biod], 27.5.1856, *Cosson* (P) - dto., 12.4.1906, *Hibon* (P) - Dj. Amoure E of Bou-alem, ca. 80 km from El Bayadh to Aflou, 1300-1400 m, 4. 6.1975, *Davis 58710* (BM). -- Wil. Chlef: infra Miliana, 500 m, 10.5.1936, *Maire* (MPU) - Zaccar de Miliana, V. 1923, *Humbert* (P) - Miliana to Teniet el Had, near Tarik ibn Zyad, 670 m, 30.5.1975, *Davis 58424* (BM). -- Wil. Tiaret: Massif du Dj. Chettaba, Zaouia, V.1878, *Reboud* (P) - Theniet-el-Had, 23.4.1867, *Letourneux* (P) - dto., V.1887, *Battandier & Trabut 233* (G, P). -- Wil. Médéa: à Chiffa, prov. Alger, 21.4.1861, *Lefebvre* (BM, W) - circa Ben Chicao, 1200 m, 24.5.1936, *Maire* (MPU, P) Boghar, 1852, *Naudin* (P) - ? Chellalat des Adaouras près Sidi Aissa, 26.5.1929, *Dubuis* (MPU). -- Wil. Djelfa: env. de Djelfa, V.1854, *Reboud* (P). -- Wil. M'sila: S'flanc du Djebel Gourine N M'Sila, 25.4.1933, *Dubuis* (MPU) - Montes de Bous-Saada, Djebel Tsegna, 1200-1500 m, 21.5.1921, *Maire* (MPU, P) - ? Barika, 23.3.1930, *Dubuis* (MPU) - ? Souk des Ouled Nadja NW Barika, 9.4.1931, *Dubuis* (MPU). -- Wil. Béjaia: Oued Sahel prope Akbou, 3.6.1889, *Letourneux* (P). -- Wil. Sétif: Mansoura to El Mehir station



Map 7. Distribution of *Astragalus geniculatus*

(Bouira to Bordj-Bou-Arreridj), 580-650 m,24.5.1975, *Davis 58260* (BM) - halfway between Sétif and Kherrata, 1000 m, 21.5.1971, *Davis 52550* (BM) - Téniet au N de Sétif, 29.4.1933, *Dubuis* (MPU) - Sétif, V.1862, *Dukerley* (P) - route de Djemila, 13.5.1935, *Gombault* (P) - entre Sétif et Ain-Abessa, 24.4.1919, *Maire* (MPU). -- Wil. Jijel: Ben Haroun gorges between Grarem et El Milia, 100 m, 22.5.1975, *Davis 58179* (BM). -- Wil. Constantine: Constantine, 14.5.1840, *Durieu* (P) - dto., 14.5.1853, *Cosson* (P) - dto., V.1873, *Reboud* in Soc. Dauph. *90* (MPU, P) - dto., V.1975, *Müller* (Hb. PODL.) - Mansourah à Constantine, *Schmitt,* Fragm. Fl. alger. exs. *573* (BM, P, W) - dto., V.1855, *Choulette*, Fragm. Fl. alger. exs. *122* (P) - Constantine, secus vias m. Mansurah, 25.5.1870, *Paris 438* (BM, P) - Sidi Mesid près Constantine, 14.5. 1853, *Perraudière* (MPU) - dto., 1853, *Cosson* (P) - Moissons du Mécis, à Constantine, IV.1857, *Choulette,* Fragm. Fl. alger. exs. *123* (P) - Telerghma, 15.6.1880, *Cosson* (P). -- Wil. Batna: Batna, *Lefrane* (P) - Djebel Tougour près Batna, 22.5.1853, *Perraudière* (MPU) - dto., 26.4. 1892, *Arbost* (MPU) - El Kantara vers Batna, *Lefranc* (P) - N du Ras Pharaoum vers 1800 m, Massif de l'Aures, 26.5. 1935, *Faurel* (MPU) - El-Kantara, V.1896, *Chevallier 44* (P) & *Chevallier 176* (MPU) - Gorges d'El Kantara, 13.4. 1931, *Dubuis* (MPU). -- Wil. Biskra: Col de Sfa (N Biskra), 28.5.1896, *Chevallier*(P) - Oued Biskra, à Biskra, 6.4.1853, *Balansa* (P) - env. de Biskra, III.1856, *Choulette*, Fragm. Fl. alger. exs. *33* (P). -- Wil. Guelma: Souk-Harras [= Souk-Ahras], VI.1864, *Reboud* (P). -- Locality not exactly defined: Bossouet, 6.6.1927, *Faure* (MPU, W) - Ardelia (Dept. Alger), 10.5.1936, *Dubuis* (MPU).

Tunesien. Prov. Kasserine: Tala, 16.5.1886, *Letour-neux* (P) - Pentes N du Djebel Chambi, *Humbert* (MPU). -- Locality not exactly defined: Tasa Louka, 1884, *Letourneux* (P).

7. **Astragalus gryphus Bunge** in Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 12. 1868 in clave and l.c. 15 (1): 13. 1869 cum descriptione ≡ *A. gryphus* var. *oranensis* Maire in Bull. Soc. Hist. Nat. Afr. Nord 39: 132. 1948, nom. illeg. **Lectotype** (here designated): Hauts Plateaux audessus de Saida, Prov. d'Oran, 1.6.1852, *Cosson* (P, Hb. BUNGE!; Iso: P!, Hb. PODL.!).

= *A. gryphus* var. *maroccanus* Maire in Bull. Soc. Hist. Nat. Afr. Nord 39: 132. 1948. **Lectotype** (here designated): Maroc occidental, Khemisset, 3.6.1912, *Pitard 2417* (P!; Iso: MPU!, Hb. PODL.!).

Plants branched at the base, covered with 0,3-1,5 mm long, rather rigid, white hairs, at the nodes and in the inflorescence also with black hairs. Stems 7-15 cm long, distinctly grooved, loosely to rather densely covered with mostly patent hairs. Stipules greenish, 4-5 mm long, triangular-acuminate, adnate at a length of 1-1,5 mm to the petiole, otherwise free, cilate at the margin or also sparsely hairy on the outer side. Leaves 2,5-4 cm long. Petiole 0,3-1 cm long, like the rachis delicate, loosely to rather densely covered with antrorsely oblique-patent hairs. Leaflets in 5-8 pairs, 3-8 mm long and 1-3 mm wide, narrowly elliptic, rounded or somewhat emarginate at the apex, covered on upper side loosely on lower side more densely with semipatent hairs. Inflorescences in the axil of the upper leaves, nearly sessile with a 2-3 mm long thickish peduncle, with (1-) 2-4 flowers. Bracts 3-5 mm long, narrowly triangular, with white and sometimes also black hairs. Flowers nearly sessile. Calyx 4-5 mm long, campanulate to funnel-shaped, loosely to rather densely covered with semipatent white hairs, at the teeth also with black hairs; teeth subulate, 2-2,5 mm long, equaling the tube. Corolla yellowish (in dried state). Standard ca. 7 mm long and 2,5 mm wide, narrowly elliptic, emarginate at the apex, narrowed at the base into a cuneiform claw. Wings ca. 6 mm long, the limb narrowly oblong, ca. 3,5 mm long and 1 mm wide, scarcely emarginate at the top; auricle less than 0,5 mm long, claw ca. 2,5 mm long. Keel c. 5 mm long, limb obliquely oblong, with lower edge broadly bent in upper part and upper edge straight, rather acute at the apex, ca. 2,5 mm long and 1,3 mm wide; auricle minute, claw ca. 2,5 mm long. Staminal tube straightly cut. Ovary sessile, densely hairy; style short, rather thick, hairy in the basal part. Pods sessile, erect, linear,

straight or weekly bent to the ventral side, 15-18 mm long, 4-4,5 mm high and ca. 4 mm broad, broadly keeled on ventral side, narrowly and deeply grooved on dorsal side, ending into a curved or nearly hooked beak; valves thin, tenacious, vaulted, weekly net-like wrinkled, brownish, rather densely covered with patent, partly very short, 0,05-0,3 mm long hairs and partly much longer, up to 1,6 mm long hairs which are often inserted in little tubercles. Legumes opening only along the ventral suture, without any septum but completely bilocular because of the deeply intruding dorsal groove. Seeds nearly quadrangular, ca. 3,5 mm long and 3 mm wide, brown, smooth, shining.
Flowering time: V.
Distribution: Morocco, Algeria.

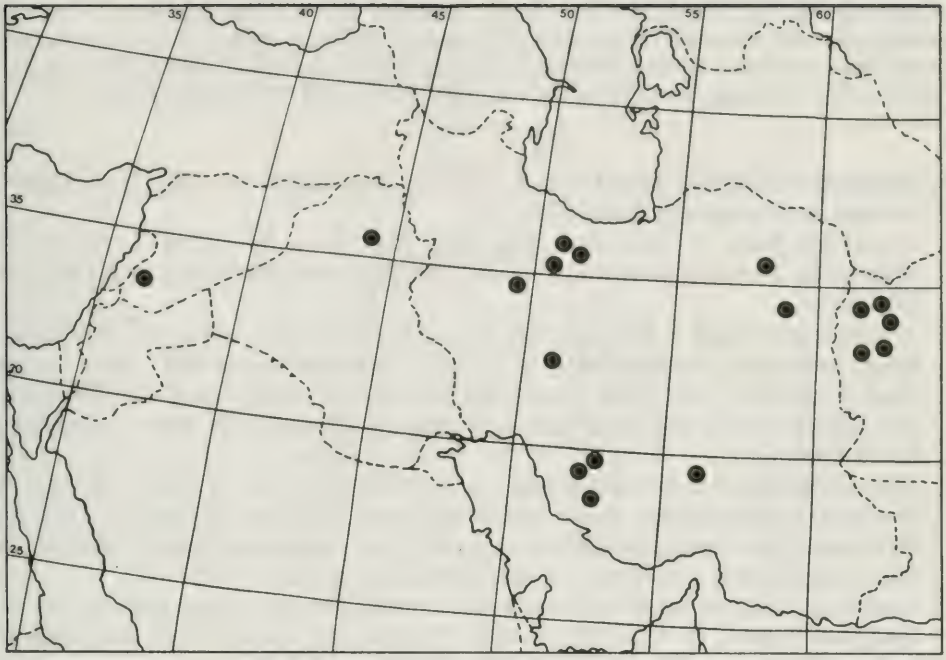
Specimens seen:

Morocco. Prov. ?: Khemisset, 3.6.1912, *Pitard 2417* (P, Hb. PODL.).
Algeria. Wil. Saïda: Hautes plateaux audessus de Saïda, 1.6.1852, *Cosson* (P, Hb. PODL.).

8. Astragalus kerkukiensis Bornm. in Repert. Spec. Nov. Regni Veg. 39: 370. 1936. **Holotypus:** in Assyria prope Kerkuk, 1893, *Bornmüller 1208* (B!)
= *A. pabotii* Mouterde in Bull. Soc. Bot. France 107: 213. 1960. **Holotypus:** Kissoué, au sud de Damas, 9.4.1953, *Pabot* (G!)

Fig.: BORNMÜLLER in Feddes Repert. Spec. Nov. Regni Veg. 39: tab. 199 B, fig. 2 & 3. 1936.

Plants annual, branched at the base, covered with soft, thin white hairs 0,2-0,7 mm long. Stems absent or up to 5,5 cm long. Stipules whitish, 1,5-2 mm long, narrowly triangular, acuminate, at the base shortly, at a length up to 1 mm adnate to the petiole, otherwise free, ciliate at the margins. Leaves 3-12 (-15,5) cm long, petiole 1,5-5,5 cm long, like the rachis sparsely covered with subappressed hairs 0,2-0,4 mm long. Leaflets (3-) 4-7 paired, 3-12 (-15) mm long and 1,5-4,5 (-6) mm broad, oblong to obovate, slightly cuneate at the base, rounded or retuse at the apex, glabrous on upper side, covered below with appressed hairs. Inflorescences sessile or with a peduncle up to 0,6 cm long and sparsely appressed hairy, densely 3-6 flowered. Bracts membraneous, ovate-acute, 1-1,2 mm long, ciliate. Calyx 2,5-3 mm long, campanulate, covered at the base with 0,1-0,3 mm long slightly spreading hairs, toward the teeth with longer and more patent hairs; teeth subulate, 1,5-1,7 mm long. Corolla white, sometimes with the keel bluish tipped. Standard 4-5 mm long and 1,5-2 mm broad, narrowly elliptic, retuse, with a very short claw. Wings 3,5-4 mm long, limb narrowly oblong, obtuse, 2-2,3 mm long and 0,8-1 mm broad, auricle 0,5-0,7 mm long, claw 1,3-1,7 mm long. Keel 2,8-3,3 mm long, limb narrowly triangular-oblong, with lower edge strongly curved and upper edge slightly rounded, ca. 1,8 mm long; auricle very short, claw 1,3-1,5 mm long. Staminal tube ending triangular-rounded at the top. Ovary sessile, glabrous or hairy, style glabrous. Legumes asymmetrical ovate with a broad rounded base and an acute top with a very short beak, 6,5-7 mm long, ca. 4 mm high and 3-3,5 mm broad, carinate ventrally, deeply grooved dorsally; valves transversally veined, covered with 0,1-0,5 mm long appressed (rarely semipatent) hairs or glabrous. Legume opening at the ventral side, completely bilocular. Seeds 2 in each locule, 2-2,5 mm long and 1,8-2 mm broad, yellowish, smooth.
Flowering time: IV-V. **Occurence:** in steppe places up to nearly 2000 m.
Distribution: Syria, Iraq, Iran, Afghanistan. Map 8.



Map 8. Distribution of *Astragalus kerkukiensis*

Remark:

In the westernmost part of the area (Syria) we can find sometimes plants (partly mixed with normal ones) the legumes of which have appressed to semipatent hairs but which are otherwise identical with typical plants of *A. kerkukiensis*. Therefore they will not get any taxonomical recognition.

Specimens seen:

Syria. Kissoué prope Damascus, 1.4.1892 et 20.4.1896, *Peyron* (G) - Kissoué, au sud de Damas, 9.4.1953, *Pabot* (G!) - dto., 14.5.1953, *Pabot* (G) - dto., 20.4.1965, *Roessler 4963* (M) & *Doppelbaur 398* (M)

Iraq. Kerkuk, 8.4.1893, *Bornmüller 1208* (B).

Iran. Prov. Tehran: Keredj, Kalaker Berge, 10.6.1934, *Gauba 23* (B) - entre Karadj et Teheran, 15.5.1956, *Schmid 5652* (G). -- Prov. Khorasan: 6 km N Kashmar, 1100 m, 5.5. 1975, *Rechinger 51274* (W) - Helali, inter Gonabad et Bejestan, 1250 m, 10.5.1975, *Rechinger 51470* (W) - Gonabad inter Kain (Gaen) et Turbat-e Haidari, 26.5.1948, *Rechin-ger & al. 4310b pp.* (W). -- Prov. Markasi: 24 km N Saveh, 1350 m, leg. ? *7236* (TARI) - 13 km from deviation Arak, Qom road to Ash-tian, 1700 m, 16.6.1984, *Mozaffarian & Maassoumi 48111a* (Hb. PODL.). -- Prov. Fars: entre Shiraz et Persepolis, 2.5.1956, *Schmid 5517* (G) - Persepolis, 2.5.1956, *Schmid 5427* (M) - 128 km from Shiraz to Abadeh, 22.4.1973, *Riazi 9112* (TARI). -- Prov. Kerman: inter Saidabad (Sirdjan) et jugum Chah Choghuk, 1700-1900 m, 28.4.1948, *Rechinger & al. 3113* (G, M).

Afghanistan. Prov. Herat: 44 km W Herat an der Straße nach Eslam Qala, 830 m, 27.4.1977, *Podlech & Jarmal 29349* (Hb. PODL.) - Kotal-i-Surkh, 15 km N Herat an der Straße nach Toraghundi,

1120 m, 28.4.1977, *Podlech & Jarmal 29407a* (Hb. PODL.). -- Prov. Farah: 17 km S Adraskan an der Straße nach Delaram, 1300 m, 25.4.1977, *Podlech & Jarmal 29199a, 29203* (Hb. PODL.) - N Shindand an der Straße nach Adraskan, 1250 m, 13.4.1973, *Anders 9572a* (Hb. PODL.) - Kareze Jan Mohammad an der Straße von Anardara nach Shindand, 1170 m, 25.4.1977, *Podlech & Jarmal 29169* (G, M, Hb. PODL.). -- Prov. Orozgan: 5 km E Tirin, 1450 m, 24.5.1967, *Freitag 887* (Hb. FREITAG)

9. Astragalus longicaulis Pomel in Bull. Soc. Sci. Phys. Algérie 11: 185. 1874. **Type:** aux environs de Mostaganem, *Pomel* (G!).

= *A. radians* Pomel in Bull. Soc. Sci. Phys. Algérie 11: 185. 1874. **Lectotype** (here designated): Terrains sablonneux du Sersou, Ain Toucria (A. Bourbaki), 14.5.1860, *Pomel* (P!; Iso: G!).

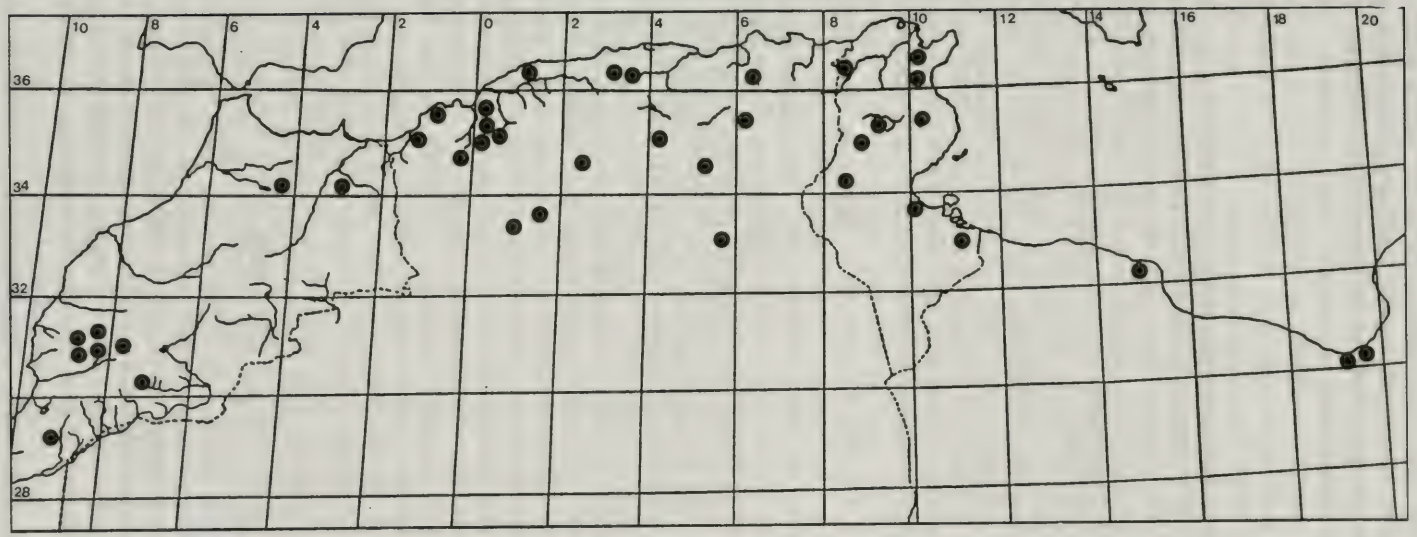
= *A. astraboides* Pomel in Bull. Soc. Sci. Phys. Algérie 11: 186. 1874 ≡ *A. asterias* Ledeb. subsp. *astraboides* (Pomel)Greuter & Burdet in Willdenowia 15: 427. 1986. **Syntypes:** Oued el Hammam près Habra, *Pomel*; Ain Toucria, 14.5.1860, *Pomel* (G!, P!); envir. de Mostaganem, *Pomel* (G!). **Lectotype** (here designated): [Algeria] O. oued el Hammam près Habra, *Pomel* (P!).

= *A. cruciatus* Link var. *pterolobus* Maire in Bull. Soc. Hist. Nat. Afr. Nord 14: 140. 1923. **Syntypes:** in alveo fluminis Acif-n-Ait-Moussa, prope Bigoudine, 700 m, 22.4.1922, *Maire* (P!); prope Oued Issen, 150-200 m, *Jahandiez 288*. **Lectotype** (here designated): Oued Issen (Sous), 200 m, 7.5.1923, *Jahandiez 288* (P!; Iso: BM!, G!, MPU!).

= *A. cruciatus* Link var. *pseudoradiatus* Sirj. in Repert. Spec. Nov. Regni Veg. 53: 229. 1944. **Syntypes:** *Pitard*, Pl. tunet. *85*; *Kralik*, Pl. tunet. *168*; Gafsa, *Pitard*. **Lectotype** (here designated): [Tunesia] Gabès, Metrech, III. 1907, *Pitard 85* (K!)

- *A. cruciatus* Link var. *garamantum* Maire in Bull. Soc. Hist. Nat. Afr. Nord 20: 180. 1929, pro parte non quoad lectotypum. **Syntypes:** in arenosis et lapidosis montium Saharae centralis, usque ad alt. 2800 m, Agerar, *Maire 503*, Hoggar, *Maire 504, 502, 499*. [The lectotype, *Maire 503* belongs to *A. saharae* Pomel!]

Plants annual, branched at the base, covered with 0,2-1,3 mm long white, at the nodes and in the inflorescence also with black hairs. Stems 8-37 cm long, finely sulcate, covered with appressed to semipatent 0,3-1 mm long hairs, density of hairs increases towards the stipules. Stipules green, 2-4,5 mm long, ovate-triangular, long acuminate, at the base at a length of 0,5-0,8 mm adnate to the petiole, otherwise free, densely covered with appressed white and black hairs. Leaves 2-6 (-7) cm long, sessile or with a petiole up to 0,5 mm long; rachis covered loosely to densely with appressed to semipatent hairs 0,4-0,8 mm long. Leaflets 6-10 paired, 3-11 mm long and 1-3 mm broad, narrowly oblong, retuse at the apex, covered on both sides, more densely on lower side with appressed up to 1 mm long hairs. Inflorescences with a 1-5,5 cm long peduncle hairy like the stem, with (3-) 5-11 flowers in a dense head. Bracts membraneous, 1-2 mm long, lanceolate acute, with mixed white and black hairs. Flowers sessile. Calyx 4-5 mm long, campanulate, covered with white and black 0,4-0,9 mm long hairs, toward the teeth with more black and longer hairs; teeth subulate, 1,5-2 mm long, slightly shorter than the tube. Corolla violet or yellow. Standard 6-10 mm long, 3-4 mm broad, elliptic, retuse at the apex, contracted into a narrow claw at the base. Wings 6-7,5 mm long, the limb narrowly oblong, obtuse, 2,8-3,5 mm long and 1-1,5 mm wide; auricle ca. 0,5 mm long, claw 2,5-3,5 mm long. Keel 4-5 mm long, the limb obliquely obovate, with lower edge strongly rounded and upper edge slightly curved, acute at the apex, 1,5-1,8 mm long; claw 2-3,2 mm long. Staminal tube straightly cut. Ovary sessile, hairy; style glabrous. Legumes sessile, star-like spreading, 9-15 mm long, 3-4 mm high and 2,5-3 mm broad, narrowly oblong, broadly bigibbous at the base, somewhat curved upwards, at the end suddenly attenuate into a recurved



Map 9. Distribution of *Astragalus longicaulis*

point, carinate on ventral side, on dorsal side with a deep groove which is distinctly widened at the base, covered with short appressed 0,05-0,15 mm long and much longer appressed to semipatent hairs up to 1,2 mm long. Pods opening along the ventral suture, completely bilocular. Seeds 6-8 in each locule, 1,2-1,8 mm long and 1-1,5 mm broad, yellow, smooth.
Flowering time: I-V, but also in autumn. **Occurence:** sandy and stony places.
Distribution: Morocco, Algeria, Libya. Map 9.

Specimens seen:

France. Dep. Hérault: Port Juvenal, near Montpellier, *Trudy* (M: adventicious).

Morocco. Prov. Fes: 15 km WSW Missour an der Straße nach Ksabi (S 329), 1000 m, 14.4.1987, *Rechtsteiner* (G, LG, MA, TARI, Hb. PODL.). -- Prov. Taza: 18 km NE Missour an der Straße nach Guércif (S 329), 14.4.1987, *Lippert 21907* (M) - dto., *Podlech 42350* (G, LE, LG, RSA, TARI, Hb. PODL.). -- Prov. Oudja: 25 km NE Taourirt nahe der Straße nach El Aioun (P 1), 470 m, 13.4.1987, *Podlech 42249* (Hb. PODL.) - 10 km W Oudja, ca. 600 m, 26.4.1936, *Samuelsson 7081* (B). -- Prov. Marrakech: Asni - Telouet road, 21.4.1936, *Simpson 36.1203* (BM) - Reraya, vallé d'Asni 1250 m, 11.6.1921, *Jahandiez 591* (P). -- Prov. Agadir: Oued Issen (Sous), 200 m, 7.5.1923, *Jahandiez 288* (P, G, BM). - Taroudant, 12.4.1931, *Jahandiez 139* (B, BM) - 40 km from Taroudant to Aoulouz, 500 m, 31.3.1969, *Davis 48974* (BM) - 16-24 km from Taroudant to Irherm, 450 m, 29.3.1969, *Davis 48902* (BM) - 10-20 km SW Tafraoute on road to Tiznit, 28.3.1972, *Davis 53787* (BM). -- Prov. Ouarzatate: 38 km SE Tazenakht an der Straße nach Foum-Zgiud (6810), 2 km N Ait M'Rabte, 950 m, 9.4.1990, *Podlech 49259* (Hb. PODL.).

Algeria. Wil. Tlemcen: Nemour, 4.5.1856, *Bourgeau* (P). -- Wil. Oran: aux Perrégaux, IV.1888, *Battandier & Trabut 432* (G, P) - env. de Trembles, 22.4.1917, *Faure* (BM) - dto., V.1919, *Battandier* (P) - près Les Lauriers Roses (Oran), 19.5.1918, *d'Alleizette* (P). -- Wil. Sidi-bel-Abbès: Sfiffef près Sidi-bel-Abbès, 1863, *Lefranc* (P) - Ras el Ma, 24.4.1919, *d'Alleizette* (P). -- Wil. Mostaganem: Mostaganem, 1844, *Delestre* (P) - dto., *Pomel* (G) - dto., V.1918, *d'Alleizette* (G, MA) - Cheliff river, NE Mostaganem, near its mouth, 29.4.1971, *Davis 51763* (BM) - Djebel Diss, 18.4.1922, *Faure* (B, M, W) - dto., 1.5.1936, *Faure* (G). -- Wil. Mascara: Bou Hanifia, 13.4.1876, *Warion* (P). -- Wil. Chlef: Orléansville [= Chlef, El Asnam], 24.4.1855, *Cosson* (P) - dto., 6.4.1873, *Joad 1882* (K) - Dahra, Si. Akacha [S Ténès], 19.5.1855, *Cosson* (P) - Dahra, Ain Tidjed, 18.5.1855, *Cosson* (P). -- Wil. Saïda: env. de Saïda, 22.5.1852, *Cosson* (P) - Crampel à Bedeau, IV.1920, *d'Alleizette* (P) - Hauts Plateaux oranais, Bedeau, 1100 m, 16.4.1921, *Faure* (B) - Hauts Plateaux près Timetlas, 25.5.1852, *Balansa 446* (G) - Geryville [= El Bayadh], 10.4.1864, *Buchinger* (P). -- Wil. Alger: Alger, 1840, *Bové* (P). -- Wil. M'Sila: Bou Saâda, 1869, *Reboud* (P) - dto., XI.1903, *Chevallier* (G). -- Wil. Constantine: Oued Rhummel, V.1889, *Girod* (G). -- Wil. Batna: Batna, *Lefranc* (P) - Biskra - Batna, *Lefranc* (P). -- Wil. Biskra: env. de Biskra, *Choulette* in Fragm. Fl. Alg. exs. *33* (G) - dto., 17.1.1912, *Coufourier* (G). -- Wil. Tamanrasset: Atakor-n-Ahaggar, in oropedio Tighaghart, 1900-2000 m, 12.3.1928, *Maire 504* (G). -- Not exactly to locate: (A) Bourbaki = Ain Toucria, 14.5.1860, *Pomel* (G, P).

Tunisia. Prov. Nabeul: Bir bou Rekba SW Nabeul, IV. 1909, *Cuénod* (G). -- Prov. Le Kef: El Kef, III.1909, *Pitard 2797* (G). -- Prov. Zaghouan: 43 km NE Kairouan an der Straße nach El Fahs, 150 m, 11.4.1980, *Podlech 34314* (Hb. PODL.). -- Prov. Kairouan: 3 km N Kairouan an der Straße nach Enfida, 60 m, 10.4.1980, *Podlech 34288* (Hb. PODL.) - Fondouk El Aouareb, 35 km SW Kairouan, 140 m, 9.3.1980, *Podlech 32841* (G, M, Hb. PODL.). -- Prov. Sousse: 4 km S Hergla, 23.3.1980, *Charpin 15973* (G). -- Prov. Kasserine: Kasserine to El Kef, 3 km S Thala, 1030 m, 9.5.1975, *Davis & Lamond D.57490* (BM). -- Prof. Gafsa: Bou Hamram, 21.4.1896, *Murbeck* (BM) - Bir Saad, 20.4. 1896, *Murbeck* (BM). -- Prov. Gabès: Gabès, III.1845, *Kralik 168* (BM) - dto., II.1913, *Pitard 2832* (G) - Gabès ad Noenara, II.1913, *Pitard 2830* (G) - El Hamdou, prope Gabès, II.1913, *Pitard 2831* (G) - Ketennah prope Gabès, II.1913, *Pitard 2829* (G) - Gabès, Metrech, III.1907, *Pitard 85* (K) - Gabès, Oued Zarzis, III.1910, *Pitard 2232* (G) - Zarzis, 13.3.1938, *Simpson 38.072* (BM) - 9 km from Zarzis on Medenine road, 31.3.1938, *Simpson 38.1136* (BM). -- Not exactly to locate: Djebel Djeloud, IV.1900, *Pitard 587* (G, MA).

Libya. Tripolitania: Sidi Mesri [= Misratha], 7.3. 1954, *Guichard Kg/Lib/589* (BM). -- Cyrenaica; 34 km W Marsa el Brega, 29.3.1939, *Simpson 39.055* (BM) - 26 km E Marsa el Brega, 17.4.1939,

Simpson 39.632 (BM) - Tarzaniet, 10 km SE Beseer [= Bashar], 9.3.1958, *Guichard Cyr/81/58* (BM)

10. Astragalus persepolitanus Boiss., Diagn. Pl. Or. Nov. 9: 60. 1849 ≡ *A. ammophilus* Kar. & Kir. var. *persepolitanus* (Boiss.)Sirj. in Repert. Spec. Nov. Regni Veg. 53: 223. 1944, comb. illeg. **Lectotype** (here designated): in ruinis templi urbis Persepolis in Persia australi, *Kotschy 226* (G-BOIS!, the one left plant on the sheet; Iso: BM!, G!, K!, W!).

= *A. ammophilus* Kar. & Kir. in Bull. Soc. Imp. Naturalistes Moscou 15: 335. 1842, nom. illeg. non Besser (1832) ≡ *Tragacantha ammophila* (Kar. & Kir.)O.Kuntze, Revis. Gen.: 943. 1891. **Type:** in collibus sabulosis Songoriae inter fontem Sassyk-pastau et montes Arganaty, *Karelin & Kirilov 1386* (Iso: G!, M!, W!)

= *A. ammophilus* Kar. & Kir. var. *baluchistanicus* Sirj, & Rech.f. in Ann. Naturhist. Mus. Wien 58: 2. 1951. **Holotype:** Persiae Prov. Baluchistan, inter Zahedan (Duzdab) et Khash, 1300-1600 m, 15.5.1948, *Rechinger & Aellen & Esfandiari 4213* (W!).

= *A. ammophilus* Kar. & Kir. var. *leiocarpus* Bornm. & Gauba in Repert. Spec. Nov. Regni Veg. 39: 97. 1935. **Holotype:** Keredj, Berge bei Kalak, 1500-1600 m, 10.6.1934, *Gauba* (B!)

= *A. vachanicus* Boriss. & Korol. in Fl. Tadzhik. 5: 655. 1937. **Type:** [Tadzhikistan] Vachan, in valle Kattacharov, 2950 m, VII.1935, *Ovczinnikov & Aphanassjiev* (not seen).

= *A. ammophilus* Kar. & Kir. var. *karjagini* Sirjaev in Repert. Spec. Nov. Regni Veg. 53: 223. 1944. **Holotype:** Transcaucasia, Armenia pr. pag. Migri, 700-900 m, 1934, *Karjagin* (BRNU) (not seen).

Plants annual, branched at the base, covered with 0,05-0,6 mm long, soft merely white hairs or with additional black hairs near the stipules and in the inflorescence. Stems 3,5-27 cm long, prostrate or ascending, covered with 0,1-0,3 mm long appressed or spreading hairs, more densely at the nodes near the stipules. Stipules whitish or pale green, 1-2 (-2,5), mm long, from broad base narrowly triangular, appressed hairy or only ciliate at the margin, at base shortly adnate to the petiole, otherwise free. Leaves 2-7 cm long, petiole (0,8-)1-2,3 cm long, like the rachis sparsely covered with spreading hairs. Leaflets 3-6 (-7) paired, 2-8,5 mm long and 0,8-3 (-4,5) mm broad, cuneate oblong or narrowly obovate, retuse at the apex, upper surface glabrous or rarely with sparse appressed hairs, lower surface covered with appressed hairs. Peduncle 0,5-7 cm long or somtimes absent, covered with short appressed or rarely spreading hairs, with 3-10 flowers in a compact head, sometimes with two superposed and remote heads. Bracts hyaline, narrowly triangular, 0,8-1,2 mm long, ciliate. Pedicels ca. 0,5 mm long, hairy. Calyx 2,5-3 mm long, campanulate, loosely to densely covered with spreading hairs, teeth subulate 0,8-1 mm long. Corolla whitish to pale violet, the tip of the keel sometimes bluish. Standard 4,5-6 (-7) mm long and ca. 2 mm broad, narrowly elliptical,rounded at the apex or slightly retuse, at the base narrowed in a short claw. Wings 4-4,5 mm long, the limb narrowly oblong, obtuse, ca. 2,2 mm long and 0,8-1 (-1,5) mm broad; auricle ca. 0,8 mm long, claw 1,8-2 mm long. Keel 3-3,8 mm long, the limb narrowly triangular-obovate, with lower edge strongly rounded and upper edge only slightly rounded, acute at the apex, with very short auricle. Staminal tube cut at right angle at the top. Ovary sessile, glabrous, with short style. Pod sessile, ovate-triangular, widest at the base, 6-9 mm long, ca. 3 mm high and 3-3,5 mm wide, carinate ventrally, deeply grooved dorsally, straight or slightly curved on the ventral side and strongly curved on the dorsal side, with a 0,7-1 mm long beak, valves thin, glabrous or covered with short subappressed hairs. Pod opening on the ventral side, fully bilocular. Seeds 2 in each locule, 1,2-2 mm long and 1-1,8 mm broad, yellowish.

Flowering time: IV-VI. **Occurence:** from the plains up to 2950 m

Distribution: Kazakhstan, Turkmenistan, Uzbekistan, Tadzhikistan, Iran, Afghanistan, Pakistan. Map 10.

Remarks:

Concerning the indument of the fruit we can distinguish two different types of plant, namely one with appressed hairy and another with glabrous pods. They often grow together within one population but also form pure stands in most cases. They correspond to: *A. persepolitanus* Boiss. (with hairy pods) and to *A. ammophilus* Kar. & Kir. (with glabrous pods). They will not be separated within the enumeration of specimens.

Specimens seen:

Azerbaidjan. Distr. Nachitchewan: Distr. Norashensk, Mountains Kabagh Jal near river Arna-tschaj, 900 m, 8.5.1947, *Grossheim & al.* (BM).

Kazakhstan. Prov. Taldy-Kurgan: inter fontem Sassyk-pastau et montes Arganaty, 1841, *Karelin & Kirilov 1386* (G, M, W).

Turkmenistan. Prov. Mary: Badghyz, Gory Gzazgjadyk, valley Nardavanly, 16.5.1956, *Botschantzev 820* (LE) - Gory Gzazgjadyk, Jarylgankala, 13.5.1977, *Botschantzev 237 b* (LE). -- Prov. Tshardzhou: Kelif, 20.4.1916, *Popov 256* (TAK: Foto in K)

Uzbekistan. Prov. Buchara: Agatme near Buchara, *Lehmann* (G-BOIS).

Iran. Prov. Semnan: inter Maiomai et Sharud, 13.6. 1948, *Rechinger & al. 5315* (G, M, W) - 28-30 km ESE Delbar versus Ahmadabad, 800 m, 28.4.1975, *Rechinger 50581* (M) -48 km ESE Delbar versus Ahmadabad, 28.4.1975, *Rechinger 50647* (W, Hb. PODL.) - Darb-Ahang, 18 km NNE Ahmadabad, 29.5.1975, *Rechinger 50683* (W, Hb. PODL.) - 5-10 km S Ahmadabad versus Zamanabad, 30.4.1975, *Rechinger 50747* (B, G, M) Jafarabad prope Zamanabad, 1200 m, 2.5.1975, *Rechinger 50910* (B). -- Prov. Khorasan: N Robat-e Qareh Bil, ad viam versus Almeh, 1200 m, 5.6.1975, *Rechinger 52900a, 52951* (W) - Gardaneh between Bojnurd and Esfaryaen, 1300-1400 m, 16.6. 1975, *Termeh 40827-E* (W) - inter Malvanlu et Alkhas Qaleh, N Shirvan, 1600-1700 m, 14.6. 1975, *Rechinger 53576a* (W) - inter Kuchan et jugum Alamli, 1600 m, 3.6.1948, *Rechinger & Aellen 7266* (W) - Koh-e-Shah Jahan, 20 km SE Esfaryen, 16.6.1977, *Soják 7671* (PR) - Gebiet von Sabzevar, Flußtal von Doroueh, 18.4. 1964, *Ruttner 620* (W) - Montes Kuh-e Nishapur, Darreh Abshar supra Akhlomat, 1600-1800 m, 30.5.1948, *Rechinger & al. 4480* (W) - Montes Hazar Masdjid, inter Gash et Tolgor, 1800 m, 7.-10.6. 1948, *Rechinger & al. 5204* (W) - inter Tayyebat et Kisil Islam Qaleh, 700 m, 21.4.1967, *Rechinger 33269* (W) - N Torbat-e Sefid, 29.5. 1977, *Runemark & Sardabi 23615* (TARI) - circa Robat Safid, 27.5.1948, *Rechinger & al. 7348* (W) - 20 km N Torbat-e Heydarieh to Mashhad, 4.6. 1977, *Runemark & Sardabi 23795* (TARI) - ad Torbat-e Heydarieh, 7.5.1948, *Rechinger & al. 4357* (W) - dto., 27.5.1948, *Rechinger & al. 4322b* (W) - S Torbat-e Heydarieh, 13.5.1939, *Gauba 951* (B) - 56-60 km N Gonabad inter Hahneh et Emrani, 900 m, 9.5. 1975, *Rechinger 57404* (G, W) & *57406* (B, W) - 22-30 km SW Ferdous versus Deyhuk, 1200 m, 10.5.1975, *Rechinger 51576* (W) - 27 km S Bejestan versus Ferdows, 1700 m, 10.5.1975, *Rechinger 51517* (W) - Helali inter Gonabad et Bejestan, 1250 m, 10.5.1975, *Rechinger 51470a* (W) - Gonabad inter Kain et Turbat-e Haidari, 26.5.1948, *Rechinger & al. 4310* (W) - Dorokhsh 40 km W Assadabad, 3.6.1957, *Rechinger 56217* (W) Sser Tschah, V.1859, *Bunge* (G-BOIS, P, W). -- Prov. Hamadan: Aq Bulaq, 100 km N Hamadan, 1960, Rioux & Golvan 283 (W). -- Prov. Esfahan: 70 km NW Nain versus Ardestan, 1700 m, 18.5.1975, *Rechinger 52026* (W) - entre Dilijan et Ispahan, 24.4.1956, *Schmid 5208* (G). -- Prov. Fars: Persepolis, 12.4.1842, *Kotschy 226, 387* (BM, G, G-BOIS, K, P, W). -- Prov. Kerman: 20 km de Sirjan à Kerman, 2.5. 1972, *Léonard 5950* (M) - inter Kerman et Saidabad (Sirdjan), inter Mashiz et jugum Khan-e Sorck, 2580 m, 27.4. 1948, *Rechinger & al. 3034* (B, G, M, W) - inter Saidabad et jugum Choghuk, 28.4.1948, *Rechinger & al. 3164* (W) - Kerman, 10.4.1859, *Bunge* (P) - dto., 2000 m, 28.4.1892, *Bornmüller 3755* (B, G, K, P, W) - zwischen Kerman und Bagh, 1847-1849, *Buhse* (P) - Laleh-zar, Baghabad, 2600 m, 19.7.1975, *Foroughi & Assadi 17897* (TARI). -- Prov. Baluchistan: inter Zahedan (Duzdab) et Khash, 13.5.1948, *Rechinger & al. 4213* (W) - in vulcano Taftan, 100 km S Zahedan, 1750 m, 25.4.1977, *Rechinger 54754* (W) - Gusheh (Kuh-e Taftan), 20.4.1973, *Soják 2565*

Map 10. Distribution of *Astragalus persepolitanus*

(PR) - Firuzabad, 47 km NW Khash, 15.4.1973, *SojáK 2201* (PR) - 10 km NNW Khash, 28.3.1973, *Soják 410* (PR).

Afghanistan. Prov. Herat: 10 km NNE Kohistan, 740 m, 27.4.1977, *Podlech & Jarmal 29391* (Hb. PODL.) - 81 km WNW Herat an der Straße nach Eslam Qala, 27.4.1977, *Podlech & Jarmal 29363* (Hb. PODL.) - 67 km W Herat an der Straße nach Eslam Qala, 27.4.1977, *Podlech & Jarmal 29358* (Hb. PODL.) - 44 km W Herat an der Straße nach Eslam Qala, 27.4.1977, *Podlech & Jarmal 29351* (Hb. PODL.) - Koh-i-Zyarat NW Herat, 26.4.1977, *Podlech & Jarmal 29303* (Hb. PODL.) - Kotal-i-Surkh, 15 km N Herat an der Straße nach Toraghundi, 1120 m, 28.4.1977, *Podlech & Jarmal 29407* (Hb. PODL.) - Herat, 22.4.1949, *Köie 3738a* (W) - between Obeh and Khodja Chisht, near latter, 10.5.1969, IHedge & al. W.7825B (Hb. PODL.) - 40 km S Herat an der Straße nach Shindand, 1500 m, 13.4.1973, *Anders 9623* (Hb. PODL.) - Harirud Valley, 1885, *Aitchison 322, 407* (G). -- Prov. Farah: 17 km S Adraskan an der Straße nach Delaram, 25. 4.1977, *Podlech & Jarmal 29199b* (G, Hb. PODL.) - 15 km NNE Shindand an der Straße nach Herat, 25.4.1977, *Podlech & Jarmal 29196* (Hb. PODL.) - Jija [= Shindand], 10.4. 1949, *Köie 4302* (W) - Jamal Ghazi, 35 km N Anardara, 25. 4.1977, *Podlech & Jarmal 29111* (Hb. PODL.). -- Prov. Helmand: Shora Ab, an der Straße von Dilaram nach Girishk, 1050 m, 20.4.1972, *Anders 8629a* (G, Hb. PODL.) - Straßengabelung Girishk - Kandahar - Lashkargah, 870 m, 17.4.1978, *Podlech 30699* (Hb. PODL.). -- Prov. Kandahar: 10 km E der Straßengabelung Girishk - Kandahar - Lash-kargah, 21.4.1972, *Anders 8670, 8670a* (Hb. PODL.) - 13 km E Keshkenakhud an der Straße nach Kandahar, 17.4.1978, *Podlech 30686* (Hb. PODL.) - 24 km E Keshkenakhud an der Straße nach Kandahar, 22.4.1977, *Podlech 28911* (Hb. PODL.) - 42 km S Tirin versus Kandahar, 1800 m, 23.5. 1967, *Rechinger 35054* (W) - Kandahar versus Kala-i-Ghilzai, ca. 1100 m, 28.4.1935, *Kerstan 247b* (W) - Flughafen Kandahar, 25 km E Kandahar, 21.4.1972, *Anders 8692* (G, Hb. PODL.) - 61 km SE Kandahar vers Spin Boldak, 30. 4.1967, *Lalande R817-S11* (Hb. PODL.) - 2 km NW Spin Boldak, 1200 m, 21.4.1972, *Anders 8712* (Hb. PODL.). -- Prov. Zabul: 9 km SE Qalat-i-Ghilzai an der Straße nach Shenkay, 1670 m, 18.4.1979, *Podlech 30791* (G, M, Hb. PODL.). -- Prov. Bamian: Darrah-e-Ajer bei Roysang, 1700 m, 14.5. 1971, *Anders 6305* (Hb. PODL.) - 8 km E Bamian, 2400 m, 13.5.1970, *Podlech 17964* (Hb. PODL.). -- Prov. Maidan: an der Straße Kabul - Ghazni, 4 km N der Brücke über den Wardak Fluß, 2120 m, 19.5.1978, *Podlech 31150* (G, Hb. PODL.). -- Prov. Kabul: Pandsche Shah (bei Kabul), 2.5. 1951, *Neubauer 48* (W) - E Kabul, 8.6.1950, *Volk 1690* (W) - 2 km E Flughafen Kabul, 29.4.1970, *Podlech 17735* (Hb. PODL.) - Tang-i-Gharu bei Mahipar, SW Shpole Baba, 1350-1500 m, 11.5.1973, *Anders 9668* (G, Hb. PODL.). -- Prov. Logar: Pulalam, 15.6.1937, *Koelz 11878a* (W) - 12 km S Pul-Alam an der Straße nach Gardez, 2110 m, 23.5.1977, *Podlech 30432a* (Hb. PODL.) - Dasht-e Sakawa, an der Straße von Pul-Alam zum Shuturgardan Pass, 23..5.1971, *Volk 71/3a* (Hb. PODL.) - zwischen Logartal und Shinkai, Dasht-e Kushi, 2300 m, 27.5.1969, *Breckle 1845* (Hb. BRECKLE) - 8 km NNE Shashqala an der Straße nach Pul-Alam (Mangokhel), 2000 m, 30.5.1978, *Podlech 31361* (Hb. PODL.) - in valle Logar, 50 km N Gardez, 2000 m, 2.6.1967, *Rechinger 35384. 35369* (W). -- Prov. Paktia: Tera Farm N Gardez, 23.5.1971, *Volk 71/136* (Hb. PODL.) - 50 km NW Urgun versus Zurmat, 10.6.1967, *Rechinger 35951* (W). -- not exactly to locate: *Aitchison 322, 407* (K, P).

Pakistan. Quetta: Spin Karez, 11.5.1965, *Kazmi 1607* (M) - 30 km NNE Quetta versus Pishin, 1500 m, 8.5.1965, *Rechinger 28884* (W) - Yaro prope Bostan, 40 km NNE Quetta versus Pishin, 1450 m, 8.5.1965, *Rechinger 28962* (W) - inter Qila Abdullah et Sheila Bagh, 8.5.1965, *Rechinger 29021* (W) - Qilah Abdulla, 5100' , 21.4.1889, *Field 3322* (K). -- Kalat: Mastung, 1851, *Stocks 1085* (K). -- Not exactly to locate: Beluchistan, 1851, *Stocks 1085* (G-BOIS).

11. Astragalus pseudosinaicus Gazer & Podlech, spec. nov. **Holotype:** Algerien, Wil. Bechar, Sahara Atlas, 22 km S Ain Sefra an der Straße nach Bechar, 1060 m,, 0°24' W - 32°40' N, 4.4.1980, *Podlech 33894a* (Hb. PODL.!; Iso: M!).

differt ab *A. sinaicus* Boiss. tota planta vestita pilis albis tantum (rarissime pilis perpaucis nigris in dentibus calycis), foliis sessilibus, caulibus pilis semipatentibus nec appressis obtectis.

Plantae annuae, basi ramosae, pilis albis tantum vestitae (rarissime pilis perpaucis nigris in

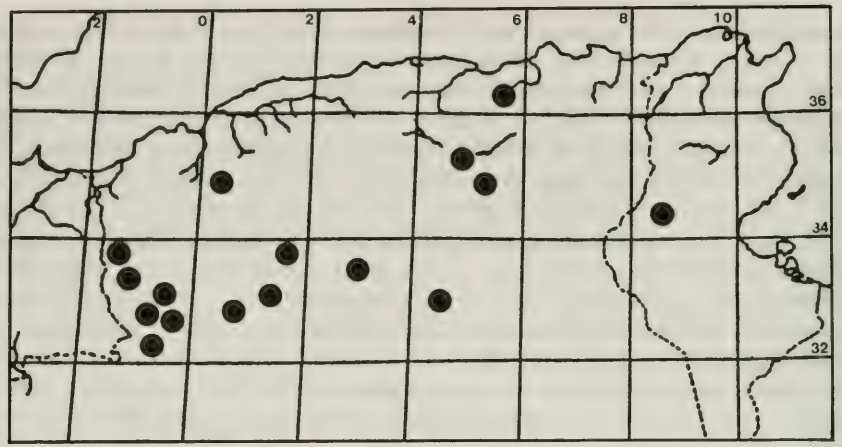
dentibus calycis). Caules prostrati vel ascendentes, pilis 0,4-1,3 mm longis semipatentibus obtecti. Stipulae 3-4 mm long, triangulares-acuminatae, breviter petiolo adnatae inter se connatae et ochream ca. 1 mm longam formantes. Folia 2,5-4 (-7) cm longa, sessilia, rachide pilis subappressis obtecto. Foliola 6-11 paria, 5-8 mm longa et 2-4 mm lata, lanceolata vel anguste elliptica, apice obtusa vel emarginata, utrimque appresse pilosa. Inflorescentiae sessiles vel interdum breviter pedunculatae, pedunculo ad 1 cm longo, capitatae, floribus 3-6, sessilibus. Calyx 4-5 mm longus, campanulatus, semipatenter pilosus, dentibus 1,5-2 mm longis. Corolla flava. Vexillum 6-7 mm longum, anguste ellipticum, leviter incisum. Alae 5-6 mm long, limbo leviter oblique emarginato, auricula ca. 0,5 mm longa. Carina ca. 4,5 mm longa limbo oblique trinagulari-obovata, acuta. Legumina ± erecta, oblongi-lanceolata, recta vel leviter curvata, basi late rotundata vel leviter bigibbosa, apice rostro curvato ca. 1 mm longo provisa, 10-12 mm longa, 2,5-3 mm alta et 3-3,5 mm lata, ventro carinata, dorso profunde sulcata, indumento duplice vestita: pilis 0,1-0,2 mm longis appressis et pilis 1-1,3 mm longis semipatentibus interdum in tuberculis minutis insertis consistente. Legumina complete bilocularia. Semina 7-8 per loculum.

Plants annual, with single stem or branched at the base, vested with 0,4-1,3 mm long nearly pure white hairs. Stems prostrate or ascending, finely striate, covered with semipatent hairs. Stipules whitish or somewhat greenish, 3-4 mm long, narrowly triangular to triangular, acuminate, hairy, connate at a length of o,5-1 mm to the petiole, connate behind the stem forming a sheath up to 1 mm long. Leaves 2,5-4 (-7) cm long, sessile (the petiole shorter than the distance between the leaflets), the rachis covered with up to 1 mm long subappressed hairs. Leaflets 6-11 paired, 5-8 mm long and 2-4 mm wide, narrowly obovate to narrowly elliptic, obtuse or retuse at the apex, covered on both sides with ± appressed hairs. Inflorescences sessile or sometimes shortly stalked with a peduncle up to 1 cm long, distributed along the whole length of the stem, with 3-6 flowers in one head. Bracts whitish hyaline, 1-2 mm long, narrowly triangular, acuminate, vested with semipatent hairs. Flowers sessile. Calyx 4-5 mm long, campanulate, covered with semipatent white hairs (only rarely with few black hairs at the teeth); teeth subulate, 1,5-2 mm long. Corolla yellowish. Standard 6-7 mm long, narrowly elliptic, 2,5-2,7 mm broad, slightly incised at the apex, at the base narrowed into a cuneiform claw. Wings 5-6 mm long, the limb narrowly oblong, obliquely and slightly emarginate at the apex, 2-3 mm long and ca. 1 mm broad; auricle ca. 0,5 mm long, claw 2,5-3 mm long. Keel ca. 4,5 mm long, the limb triangular-obovate, with lower edge strongly rounded and upper edge slightly rounded, acute at the apex, 1,5-1,8 mm long; auricle very short, claw ca. 3 mm long. Staminal tube straigtly cut. Ovary sessile, densely hairy; style glabrous. Legumes sessile, ± erect, narrowly ovate-oblong, straight or slightly curved to the ventral side, broadly rounded at the base or slightly bigibbous, 10-12 mm long, 2,5-3 mm high and 3-3,5 mm broad, carinate on ventral side, deeply grooved on dorsal side, with a curved to hooked beak ca. 1 mm long at the apex, vested with a double indumentum: densely with 0,1-0,2 mm long appressed hairs and with 1-1,3 mm long semipatent hairs sometimes inserted in little tubercles. Pod opening on ventral and dorsal side, with a septum ca. 1 mm wide but completely bilocular because of the deeply intruding dorsal groove. Seeds 7-8 in each locule, ca. 2 mm long and 1,5 mm broad, smooth.

Flowering times: III-IV. Occurence: in deserts and semi-deserts.
Distribution: Morocco, Algeria, Tunesia, Egypt. Map 11.

Remark:

This species which is similar to *A. sinaicus* can be easily distinguished from the latter by its indumentum of merely white hairs, the sessile leaves and the stems with semipatent hairs. Within the North African species of the section *Sesamei* it is the most adapted one to true desert conditions and therefore it is only found in the middle part of Algeria and in



Map 11. Distribution of *Astragalus pseudosinaicus*

southwestern Tunesia.

Specimens seen:

Morocco: El Ardja, in arenosis desertis, III.1913, *Pitard 3318* (P).

Algeria. Wil. Saïda: près de Timetlas (cercle de Saïda), 25.5.1852, *Balansa 446* (K) - Ain Ben Khelil, S du Chott El Gharbi, 30.4.1856, *Cosson* (P) & *Kralik* (MPU, P) - dto., 30.5.1856, *Bourgeau* (MPU) - Ain Sefra, 7.5.1856, *Cosson* (P) - dto., 20.4.1988, *Bonnet & Maury* (P) - dto., 29.5.1931, *Faure* (P) - dto., 20.5.1934, *Faure* (MA, MPU, P) - Tiout, 17.4.1906, *Romieux 633* (P) - 22 km S Ain Sefra an der Straße nach Bechar, 1060 m, 4.4.1980, *Podlech 33894a* (M, Hb. PODL.) - de Moghrar-Tahtani à Djenier-Bou-Resq, 16.4.1888, *Bonnet & Maury* (P) - Djebel Nzireb, 18.5.1856, *Cosson* (P) - Djebel Amour, 69 km from El Bayadh to Aflou (E of Boualem), 1350 m, 4.6.1975, *Davis 58716* (BM) - El Macta [E Boualem], 6.6.1856, *Cosson* (P) - El Abiod Sidi-Cheikh, 4.5.1899, *Chevallier 291* (P) - Brezina, 23.5.1856, *Cosson* (P). -- Wil. Laghouat: Laghouat, 13.6.1856, *Cosson* (P) - dto., 13.4.1897, *Chevallier 185* (MPU). -- Wil. Batna: Mdoukal [SE Chott Hodna], 1860, leg. ? (P) - El Hadjira [SE Chott Hodna], 28.4. 1858, *Cosson* (P). -- Wil. Biskra: Mchounech, IV.1858, *Cosson* (P) - Col de Sfa [N Biskra], 25.5.1899, leg. ? (MPU) - Saada au S de Biskra, 11.4.1852, *Cosson* (P). -- Wil. Ouargla: entre El Tarch et Guerara dans La M'zab, 20.5.1958, *Cosson* (P).

Tunisie. Prov. Gafsa: Gafsa, IV.1909, *Pitard 1806* (G).

Egypt: vicinity of Mersa Matruh, VI.1973, *Amal Amin* (Herb. Suez Canal Univ.)

12. Astragalus saharae Pomel in Bull. Soc. Sci. Phys. Algérie 11: 184. 1874 ≡ *A. pseudostella* Boiss. (erroneously 'Delile') subsp. *saharae* (Pomel)Batt. in Battandier & Trabut, Fl. Algérie 1: 256. 1889 **Syntypes:** Oueds sahariens: Metlili, Mehaïguen, all *Pomel.* **Lectotype** (here designated): Mzab à Metlili, *Pomel* (MPU!; Iso: G!, P!).

= *A. cruciatus* Link subsp. *aristidis* Batt. in Battandier & Trabut, Flore Algérie 1: 256. 1889 ≡ *A. aristidis* (Batt.)Batt. & Trabut, Fl. Algérie Tunisie: 107. 1905 ≡ *A. asterias* Steven subsp. *aristidis* (Batt.)Greuter in Willdenowia 15: 427. 1986. **Syntypes:** Guélat-es-Snam, 12.5.1886 & 15.5.1886, *Letourneux*. **Lectotype** (here designated): [Tunisie] Guélat-es-Snam [= Kalaat Es Senan], in cacumine, 12.5. 1886, *Letourneux* (P!; Iso: P!).

= *A. cruciatus* Link var. *aster* Jahand. & Maire in Bull. Soc. Hist. Nat. Afr. Nord 14: 67. 1923. **Lectotype:** Maroc, Grand Atlas, Rerayra, vallée d'Asni, 1250 m, 11.6.1921, *Jahandiez 591*

(MPU!; Iso: P!)

= *A. cruciatus* Link var. *garamantum* Maire in Bull. Soc. Hist. Nat. Afr. Nord 20: 180. 1929. **Syntypes:** in arenosis et lapidosis montium Saharae centralis, usque ad alt. 2800 m, Agerar, *Maire 503*; Hoggar, *Maire 504, 502, 499.* **Lectotype** (here designated): In ditione Ahaggar, In-Eker, 1080 m, 4.3.1928, *Maire 503* (P!; Iso: MPU!, P!).
(Remark: The plants of *Maire 504* belong to *A. longicaulis* Pomel)

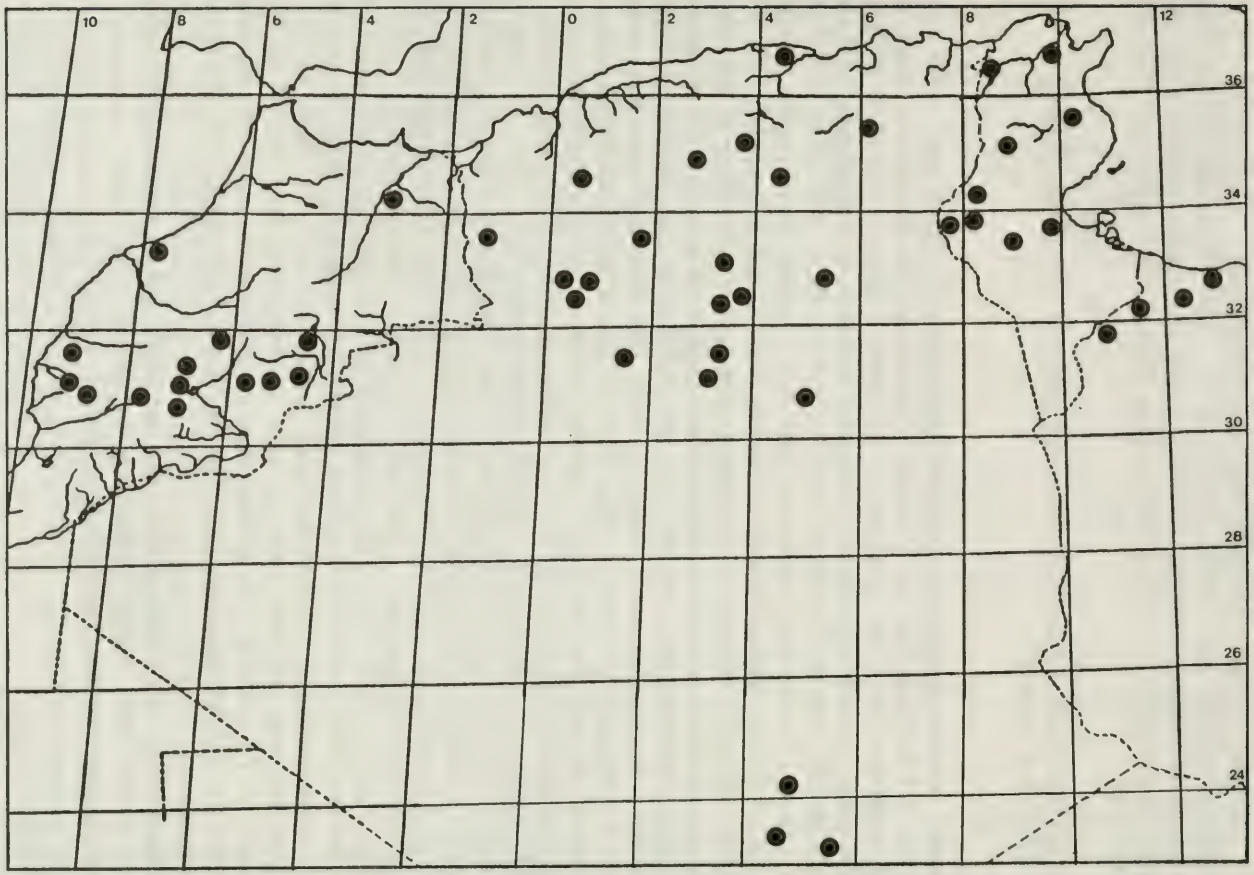
= *A. rené-mairei* Eig, Syst. Stud. Astrag. Near East: 14. 1955. **Syntypes:** Tunisia, Nefta, about 15 km S of Tozeur; 10 km S of Nefta; environs of Degache; all 24.3.1930, *Eig.* **Lectotype** (here designated): Tunisia, Nefta, about 15 km S of Tozeur, 24.3.1930, *Eig* (HUJ!; Iso: W!).

Figures: BONNET, E. & G. BARRATTE, Illustr. esp. nouv. rar. crit. Phaner. Tunisie: pl. VII, fig. 1-8. 1895 (as *A. aristidis*).

Plants annual, branched at the base, covered with appressed 0,2-1,3 mm long, white hairs and sometimes with few black hairs on the stipules, the bracts and the teeth of calyx. Stems 6-30 cm long, prostrate to erect, slightly angular, loosely pilose to more densely pilose in upper part. Stipules green, 2-3 mm long, narrowly triangular, acuminate, at a length of 0,5-0,8 mm adnate to the petiole, connected behind the stem into a short sheath, white hairy with some black hairs. Leaves 1,5-4 cm long; petiole very short, 0,3-1 cm long, like the rachis covered with apressed 0,2-0,7 mm long hairs. Leaflets 6-9 paired, 2-9 (-11) mm long and 1-2,5 (-3) mm broad, narrowly elliptical to narrowly oblong, obtuse at the apex, apressed pilose on both sides. Inflorescences sessile or subsessile in lower part of the stem and with a peduncle 1-5 cm long in the upper part of the stem, pilose like the stem, with 3-7 flowers in a dense head. Bracts membraneous, 1-2 mm long, narrowly triangular, acute, with white and a few black hairs. Flowers with a pedicel ca. 0,5 mm long. Calyx 5-6 mm long, campanulate, white appressed hairy with some black hairs at the teeth; teeth subulate, 1,5-1,8 mm long, nearly half as long as the tube. Corolla yellow. Standard 6-7,5 mm long, 1,8-2,9 mm broad, oblong-ovate, retuse at the apex. Wings 5-6,3 mm long, the limb narrowly oblong, rounded at the apex, 2-3 mm long and 1-1,5 mm broad; auricle ca. 0,5 mm long, claw 2-3 mm long. Keel 4-5 mm long, the limb triangular-obovate, with lower edge broadly rounded, the upper edge slightly curved, obtuse at the apex, 1,2-2,5 mm long and 1-1,2 mm broad; claw 2-2,5 mm long. Staminal tube straightly cut. Ovary very shortly stalked, hairy; style glabrous.Legumes star-like spreading to erect, linear-oblong, slightly curved, 11-15 (-18) mm long, 2-2,5 mm high and 3-3,5 mm broad, rounded at the base, with a short recurved beak, carinate on ventral side, deeply grooved on dorsal side, covered with two kind of hairs (double indumentum): with very short, 0,05-0,15 mm long appressed hairs and much longer, apressed to subappressed hairs inserted on little tubercles and up to 1,3 mm long. Pods opening along the ventral suture, completely bilocular. Seeds (5-) 7-8 in each locule, oblong-rectangular, 1,8-2 mm long and 1,2-1,4 mm broad, dotted-scrobiculate.
Flowering time: II-VI. **Occurence:** in steppe and semi-desert regions mainly on sandy soils, up to 1500 m, in the Central Saharian Mountains up to 2500 m.
Distribution: Morocco, Algeria, Tunesia, Libya. Map 12.

Specimens seen:

Morocco. Prov. Taza: Guercif, bord de la Moulouya, 26.4.1925, *Jahandiez 80* (G) - 21 km NE Misour an der Straße nach Guercif (S 329), 830 m, 14.4.1987, *Podlech 42335a* (Hb. PODL.). -- Prov. Marrakech: Rerayra, vallée d'Asni, 1250 m, 11.6.1921, *Jahandiez 591* (P). -- Prov. Agadir: 6 km SW Argana an der Straße nach Agadir (P 40), 830 m, 23.4.1987, *Lippert 22558* (M) - dto., *Podlech 42969*



Map 12. Distribution of *Astragalus saharae*

(Hb. PODL.) - dto., *Rechtsteiner* (G, MA, Hb. PODL.) - Hoher Atlas, 26 km SW Argana an der Straße nach Agadir (P 40), 930 m, 23.4.1987, *Lippert 22541* (M). -- Prov. Ouar-zazate: 32 km NW Ouarzazate on road to Marrakech, 1300 m, 17.6.1974, *Reading Univ./B.M. Exped. 805* (BM) -7 km NE Ouarzazate an der Straße nach Skoura (P 32), 1140 m, 18. 4.1986, *Podlech 41065* (Hb. PODL.) - 23 km SE Ouarzazate an der Straße nach Zagora (P 31), 1310 m, 10.4.1990, *Podlech 49325* (G, Hb. PODL.) - 35 km SE Ouarzazate an der Straße nach Zagora, NW Ait Saoun, 10.4.1990, *Podlech 49361* (Hb. PODL.) - Imiter, 21 km E Boulmane du Dadès an der Straße nach Tinerhir, 1380 m, 17.4.1987, *Podlech 42658* (G, Hb. PODL) - dto., *Lippert 22219* (M) - 12 km E Tinerhir an der Straße nach Goulimna (P 32), 1250 m, 17. 4.1987, *Rechtsteiner* (Hb. PODL.) - 22 km W Tinejdad an der Straße von Goulmina nach Tinerhir (P 32), 1100 m, 16.4.1987, *Lippert 22147* (M) - dto., *Podlech 42605a* (Hb. PODL.). -- Prov. Er-Rachidia: 12 km E Tinejdad an der Straße nach Erfoud (3451), 980 m, 16.4.1987, *Podlech 42564* (G, Hb. PODL.) - 3 km SE Meski an der Straße nach Erfoud (P 21), 970 m, 16.4.1987, *Podlech 42471* (Hb. PODL.). -- Not exactly to locate: El Khérouan. IV.1913, *Pitard 3324* (K).

Algeria. Wil. Mostaganem: Mostaganem, 18.6.1848, ? (P). -- Wil. Bechar: 22 km S Aïn Sefra an der Straße nach Bechar, 1060 m, 4.4.1980, *Podlech 33894b* (G, M, Hb. PODL.) - 40 km S Aïn Sefra an der Straße nach Bechar, 950 m, 4.4.1980, *Podlech 33868* (G, M, Hb. PODL.) - 27 km NE Bechar an der Straße nach Aïn Sefra, 880 m, 4.4.1980, *Podlech 33836a* (Hb. PODL.) - Tiout, 15 km E Aïn Sefra, 1080 m, 5.4.1980, *Podlech 33912* (G, M, Hb. PODL). -- Wil. Saïda: Hauts Plateaux oranais, entre Bedeau et Grampel, 25.4.1919, *Faure* (M). -- Wil. Tiaret: Tiaret to Aflou, between Ain Deheb and Hassiane-Ed-Dih, 1100 m, 1. 6.1975, *Davis 58575* (BM). -- Wil. M'sila: Bou Saâda, IV. 1937, *Simpson 37.086, 37.1284* (BM) - near Baniou, Schott el Hodna, ca. 405 m, 12.4.1937, *Alston & Simpson 137* (BM) - 15 km S Saada, IV.1853, *Balansa* (P). -- Wil. Djelfa: 38 km NW Laghouat an der Straße nach Aflou, 6.4.1980, *Podlech 34049a* (Hb. PODL.). -- Wil. Laghouat: 42 km SW Aflou an der Straße nach El Bayadh, 1460 m, 6.4.1980, *Podlech 34029* (Hb. PODL.) - 47 km NW Berriane an der Straße nach Laghouat, 750 m, 11.4.1982, *Podlech 37111* (Hb. PODL) - Ghardaia, 1.5.1897, *Chevallier* (P) - Mzab à Metlili, *Pomel* G, MPU) - Hassi-Fahl, 115 km S Ghardaia an der Straße nach El Golea, 360 m, 11.3.1981, *Podlech 34627* (G, LG, M, Hb. PODL.) - 125 km NNE El Golea an der Straße nach Ghardaia, 380 m, 26.3.1981, *Podlech 35473* (G, LG, M, Hb. PODL.) - Guerrera, Mzab, 22.5.1858, *Cosson* (P) - Zelfana, 55 km ESE Ghardaia, 360 m, 30.3.1981, *Podlech 35548* (G, LG, M, Hb. PODL.). -- Wil. Batna: entre Batna et Ksour, 28.3.1858, *Cosson* (P) - El Abiod, Sidi Cheikh, 4. 5.1899, *Chevallier 291 p.p.* (G) - El Kantara, 7.2. 1897, *Collett* (K). -- Wil. Biskra: Oued Biskra, à Biskra, 1853, *Balansa* (G, P) - Biskra, *Marès* (P) - dto., 10.2. 1852, *Jamin* (P) - Chegga, Oued Rir,IV.1858, *Cosson* (P) - Mguebra, Oued Rir, 8.4.1958, *Cosson* (P). -- Wil. Ouargla: Hassi de Sidi Mohamed, Oued Mzab, 9.5.1858, *Cosson* (P). -- Wil. Tamanrasset: In-Eker, 1080 m, 4.3.1928, *Maire 503* (MPU, P) - Ahaggar, Taharanet, 5900', 10.3.1931, *Meinertzhagen 38* (BM) - Ahaggar, Imarera, 24.3.1928, *Maire 502* (HUJ, P) - Hoggar, Assekrem, 2500 m, IV.1868, *Gauthier 11866* (G) - dto., 25.3.1980, *Podlech 33379* (M, Hb. PODL.) - Hoggar, Guelta im Oued Zerzaoua, 10 km NNE des Guelta Issakkarassene an der Piste von Hirafok zum Assekrem, 1810 m, 21.3.1981, *Podlech 35042* (Hb. PODL.).

Tunesia. Prov. Bizerte: Djebel Ichkeul, 18 km WSW Bourguiba, 3.4.1981, *Podlech 35749* (Hb. PODL.). -- Prov. Le Kef: Guelaat-es-Snam [= Kalaat es Senan], 12.5.1886, *Letourneux* (P) & 15.5.1886, *Letourneux* (P). -- Prov. Zaghouan: 31 km from El Fahs on road to Kairouan, 160 m, IV.1975, *Davis & Lamond D.57001* (BM). -- Prov. Kasserine: N' slope of Djebel Chambi, W Kasserine, 750-800 m, 9.4. 1975, *Davis & Lamond D.57465* (BM) - N of Sbeitla, 16 km from Sbiba, 730 m, 4.5.1975, *Davis & Lamond D.57185* (BM) - Oued Zitouna inter Sidi Ceich et Feriana, 21.6.1884, *Letourneux* (P). -- Prov. Gafsa: Hazoua, tunesische Grenzstation an der Straße von Gafsa nach El Oued, 40 m, 10.3. 1980, *Podlech 32852* (Hb. PODL.) - Nefta, IV.1932, *Gougerot-Nicot* (P) - dto., 26.2.1949, *Cuénod* (G) - dto., 25.3. 1930, *Eig* (W) - 3 km W Touzeur, 45 m, 9.4.1980, *Podlech 34148* (G, M, Hb. PODL.) - Tozeur, IV.1908, *Pitard 361* (BM) - dto., IV.1932, *Gougerot-Nicot* (P) - 6 lm SW Metlaoui, 140 m, 10.4.1980, *Podlech 34206* (G, Hb. PODL.) - 2 km W Metlaoui, ca. 300 m, 1.4.1981, *Podlech 35642* (M, Hb. PODL.) - 14 km NE Gafsa an der Straße nach Kairouan, 340 m, 10.4.1980, *Podlech 34230* (G, HUJ, M, Hb. PODL.). -- Prov. Gabès: Gabès, 13.3.1834, *Kralik 168* (K, P) - dto., 11.-18.4.1884, *Letourneux* (P) - dto., 6.3.1900, *Pitard* (BM) - El Hamma prope Gabes, 26.4.1884, *Letourneux* (P) - Gabès ad Ketermah, Oued Zarkies, III.1909, *Pitard 1393* (K) - Gabès, Metrech, III.1907, *Pitard 85* (M) - Sidi-Boul-Baba prope Gabès, 3.4.1854, *Kralik* (P) - Oase Douz,

22.3.1971, *Röthlisberger* (G). -- Prov. Medenine: Medenine, IV.1932, *Gougerot-Nicot* (P) - Djerba, 5.3.1968, *Leippert 7043* (B).

Libya. Tripolitania: Sabratha, 13.6.1966, *Townsend 66/18* (K) - km 55, Sabratha road., 15.6.1952, *Guichard Kg/Lib 482* (BM) - Gebel Nefoussa, 106 km E Giado, 600 m, 1970, *Davis 49653* (K) - Tripolis, IV.1932, *Baschant* (B) - Tripolis, ad Gargarenih, IV.1933, *Bornmüller 690* (B) - Sidi el Macri prope Tripoli, 6.4.1886, *Letourneux* (P) - Tidgonria, Tripoli, 1853, *Vogel* (BM) - E Tripoli, 5.4. 1886, *Letourneux* (P) - Fonduk Nagaza, 25 km W Homs, 27.3.1939, *Sandwith 2051* (K).

13. Astragalus schimperi Boiss., Diagn. Pl. Or. 2: 53. 1843 ≡ *Tragacantha schimperi* (Boiss.) O.Kuntze, Revis. Gen.: 948. 1891. **Holotype** (here designated): Sinai] Arabia petraea, Wadi Ferran, 18.3.1835, *Schimper 238*, ed. H. HOHENACKER (G-BOIS!; Iso: BM!, G!, HAM!, K!, M!, P!, W!).

= *A. schimperi* subsp. *magnus* Eig, Syst. Stud. Astrag. Near East: 14. 1955. **Holotype:** S' Iraq, 92 km W of Basra, 8.4.1933, *Eig & Zohary* (HUJ!).

= *A. schimperi* var. *multifoliolatus* Eig, Syst. Stud. Astrag. Near East: 14. 1955. **Holotype:** Syria, Syrian Desert, 33 km SW of Deir-ez-Zor, 30.4.1933, *Eig & Zohary* (HUJ!).

= *A. schimperi* var. *subsessilis* Eig, Syst. Stud. Astrag. Near East: 13. 1955. **Syntypes:** S' Iraq, Salbie, SW of Ez-Zubair (S of Basra); between Et-Tuba and Er-Rumail Station; Er-Rumail Station; Jaliba Station (all NW of Basra), 8.4.1933, *Eig & Zohary*. **Lectotype** (here designated): env. of Jaliba (SW of Ez Zubair), 8.4.1933, *Eig & M.Zohary* (HUJ!; Iso: HUJ!).

= *A. schimperi* var. *aravensis* Zohary in Fl. Palaestina 2: 455. 1972. **Holotype:** Palestine, Arava valley, 8 km N of Ein Rhadian, 1950, *D.Zohary 14801* (HUJ!)

= *A. schimperi* var. *aradensis* Zohary in Fl. Palaestina 2: 455. 1972. **Holotype:** Palestine, E. Negev, about 4 km E of Dimona, 1961, *Zohary 9* (HUJ!).

Figures: ZOHARY, Fl. Palaestina 2, part two: plate 76. 1972. - TOWNSEND in Flora of Iraq 3: 256, plate 37, fig. 1-9. 1974.

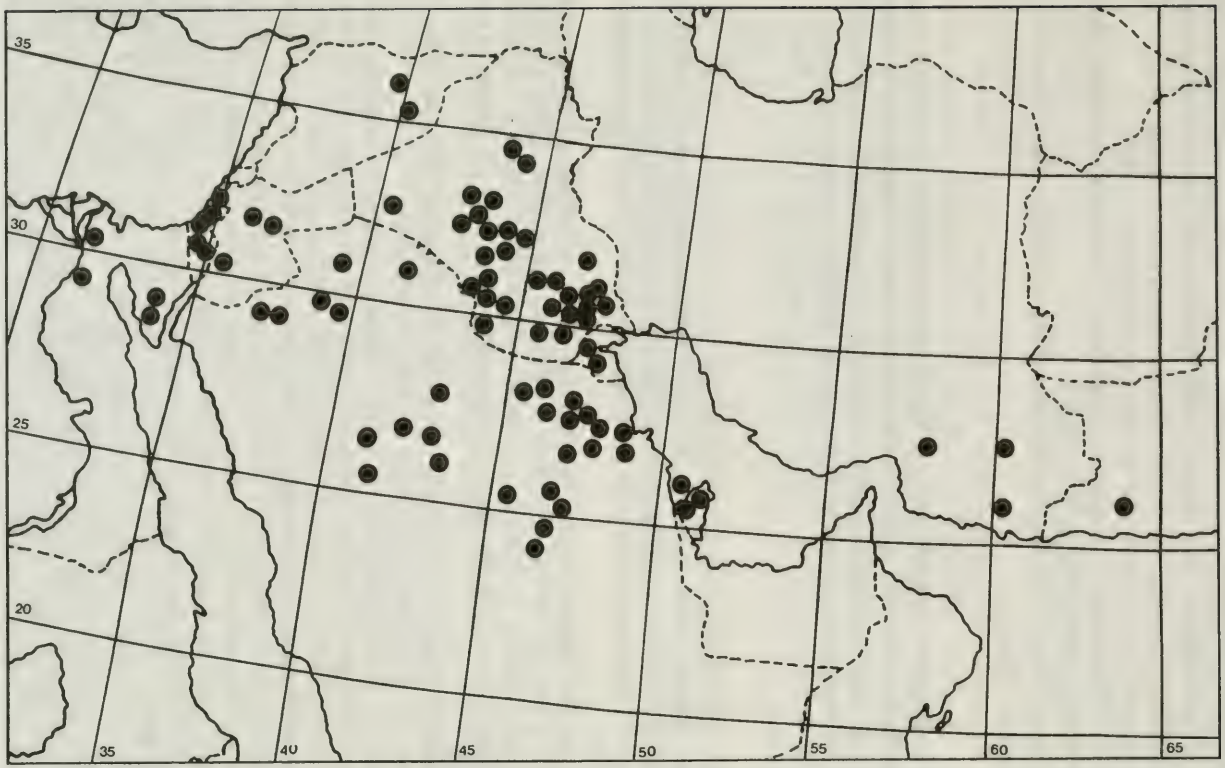
Plants branched at the base, very densely covered with subappressed to semipatent 0,4-1,5 mm long (on pod up to 2,4 mm long) white-silvery shining hairs, at the stipules and in the inflorescence, rarely on the rachis also with black hairs. Stems up to 23 cm long or sometimes nearly absent, prostrate to ascending, densely antrorsely semipatent hairy. Stipules green or greenish, 2-4 mm long, narrowly triangular, acuminate, adnate at a length of 0,6-1,2 mm to the petiole, otherwise free, covered with subappressed white and scattered black hairs, ciliate at the margin. Leaves 1,5-4 cm long; petiole 0,5-1,4 cm long, like the rachis densely subappressed to semipatent hairy. Leaflets (4-) 6-8 paired, (2,4-) 3-10 (-12) mm long and (1-) 1,5-3 mm broad, narrowly elliptic to narrowly oblong, obtuse to subacute at the apex, densely covered on both sides with subappressed hairs. Inflorescences nearly sessile or the upper ones with a peduncle up to 4,2 cm long, densely covered with subappressed to semipatent white hairs, towards the inflorescence also with black hairs. Flowers (1-) 2-5. Bracts 1,5-2 (-2,5) mm long, linear to narrowly triangular, acuminate, with white and black hairs. Flowers sessile. Calyx 5-7 (-8) mm long, tubular, densely covered with subappressed white and black hairs, towards the teeth with somewhat longer and more patent hairs; teeth subulate, (1,2-) 1,7-2,1 mm long. Corolla white or pale violet. Standard 8-10 (-11) mm long and 2,5-3 mm broad, narrowly rhombic to narrowly obovate, slightly retuse at the apex. Wings 7-8 (-8,5) mm long; the limb narrowly oblong, slightly emarginate, 3-3,5 (-4) mm long and 0,8-1,1 mm broad; auricle ca. 0,5 mm long, claw (3-) 3,5-4 mm long. Keel 5,5-6,2 (-7) mm long; limb triangular-obovate, with lower edge strongly curved and upper edge only slightly curved, 2-2,8 mm long and 1,2-1,5 mm broad; auricle very short, claw (2-) 3-4,2 mm long. Staminal tube straightly cut. Ovary sessile, densely

hairy; style short, glabrous. Legume sessile, stellately arranged or indifferent in direction, narrowly oblong, rounded at the base, straight or slightly curved, 15-22 mm long, 3-3,3 mm high and 3-4 mm broad, slightly carinate at the ventral side, deeply grooved at the dorsal side, ending in a 0,8-1 mm long straight beak; valves thin, straw-colored, covered with two kind of hairs (double indumentum): densely with very short appressed, 0,1-0,3 mm long hairs and only loosely with subappressed to somewhat semipatent up to 2,4 mm long hairs which are sometimes inserted on little tubercles. Pod opening at the ventral suture, with septum 0,5-0,8 mm wide, but fully bilocular because of the deeply intruding dorsal groove. Seeds 10-11 (-14) in each locule, nearly globular, 1-1,4 mm in diameter, dark or pale brown, smooth.
Flowering time: II-VI. **Occurence:** in steppe and semi-desert areas, mostly on sandy soil, widely distributed in the plains but ascending up to 1000 m.
Distribution: Egypt, Saudi Arabia, Kuwait, Bahrein Island, Oman, Israel, Jordan, Syria, Iraq, Iran, Afghanistan, Pakistan. Map 13.

Remark:
A plant collected by *Zohary* from Israel, Negev, Tel-'Arad road, about 4 km E of Dimona, 26.3.1961 (HUJ!) has fruits with only a simple indumentum consisting of scattered up to 1 mm long ± patent bristles but otherwise like *A. schimperi*. It was named *A. schimperi* var. *aradensis* Zohary. It surely is a rare mutation in which the short hairs of the fruit are suppressed.

Specimens seen:

Libya. Wadi Tengesir, 2.3.1952, *Guichard KG/LIB/424* (BM).
Egypt. Wadi Gerrawi, Helouan, 1.4.1945, *Davis 10530* (K) - Wady Arabah (Da.sept.), 22.3.1928, *Simpson 5820* (K) - WADY Arabah, en route to Deir San Antonio, 25.3.1928, *Simpson 5850* (K). -- Sinai: Wadi Ferran, 8.3.1885, *Schimper 238* (BM, G, G-BOIS, HAM, K, M, P, W) - SW of Ayn Mûsa, 19.3. 1904, *Kneucker* (B).
Israel: Negev, env. of Ein Ghadian, 23.3.1950, *Orshansky* (HUJ) - Hazeva, 4.3.1983, *Liston* (HUJ) - E. Negev, about 4 km E of Dimona, 1961, *Zohary 9* (HUJ!) - Arava valley, Yahel, 5.3.1983, *Liston* (HUJ) - Arava valley, Ketura, 5.3.1983, *Liston* (HUJ) - Arava valley, 1 km E of Timna nr. Arava Highway, 14.3.1988, *Danin* (HUJ, Hb. PODL.) - Arava valley, 8 km N of Ein Rhadian, 1950, *D.Zohary 14801* (HUJ!).
Jordan: Jebel el'Uweinid W Azraq, 21.4.1965, *Townsend 65/188* (K) - Khanasir, 20.4.1900, Post (G) - Ma'an: 30 km N Mudawwa, 720 m, 14.4.1980, *Frey & Kürschner 80-698* (HUJ).
Saudi Arabia: 12 km W of Turaya Camp, 2900', 1.4.1983, *Collenette 4244* (K) - Badanah, Tapline pump station, 10. 7.1964, *Mandaville 265* (BM) - Badanah, 1200', 23.3.1966, *Dickson 1044* (K) - 12 km N Jabal 'Amudah, 6.4.1967, *Man-daville 1005* (BM) - 85 km S of Thaniyat, 2600', 21.3. 1932, *Collenette 3454* (K) - 120 km SE of Thaniyat camp, 20.3.1982, *Collenette 3449* (K) - Al Jawf, 2000', 26.2. 1971, *Wood W/80a* (BM) - Al Mazara, N of Doumat al Jandal, 2.1.1984, *Al-Hassan 91* (RIY) - near Zabirah, ca. 200 km N Buraydeh, 1800', 23.4.1981, *Collenette 2534* (K) - Al-Batin, 22 km SW Hafar al-Batin, 27.3.1981, *Hillcoat 352* (BM) - Nejid, Hafar el Batin, 20.3.1946, *Vesey-FitzGerald 15610/1* (BM) - 3 km ESE 4-corner boundary pt., wadi tributary to al-Batin, 21.3.1968, *Mandaville 1608, 1622* (BM) - NE'Arabia, 28°41' N - 47°35' E, 22.3.1968, *Mandaville 1695* (BM) - Ash-Shaqq, 22.3.1968, *Mandaville 1710* (BM) - 2 km S Saudi-Kuwait border at long. 47°14', 22.3.1968, *Mandaville 1656* (BM) - Safaniya, 23.2.1968, *Longhitano* (RIY nr. 9348) - near Hail, 1000', 23.3.1962, *Zeller 7701* (BM) - Shari, 685 m, 29.3.1962, *Zeller 8703* (BM) - 20 km N Al Lihabah, 7.4.1966, *Mandaville 618* (BM) - near Qariyat al Ulya, off the Tapline road, 800', 29.3.1987, *Collenette 6177* (K) - 15 km ENE Qariyat al Ulya, 22.2.1968, *Mandaville 1265* (BM) - 17 km WSW Abu Hadriyaqh, 2.3.1972, *Mandaville 3263* (BM) - Abu Hadriyah, 23.3.1968, *Mandaville 1750* (BM) - 12 km S Saqf, 10.3.1962, *Zeller 5102* (BM) - W Sha'bah, 9.3.1962, *Zeller 4808* (BM) - 10 km W Buraydah, 27.2.1974, *Mandaville 3975* (BM) - Dhahran, 3. 4.1968, *Mandaville 1837* (BM) - 10-20 km S Rumah, III. 1979, *White 82* (K) - Nafud Rumah, *Draz* (RIY Nr. 9337) - S of Nuqra, between Medina and Buryadah, 3000', 10.3.1977, *Collenette 65* (K) - Riyadh al Khabra, W of Buryadeh, 2000',



Map 13. Distribution of *Astragalus schimperi*

13.2.1980, *Collenette 1826* (K) - between Hanahiyah and Nuqra, on Medina - Buraydah road, 3000', 7.3.1977, *Collenette 36* (K) - Al Amau, 120 km WSW of Riyadh, 2900', 2.3.1983, *Collenette 4037* (K) - Rodah Al-Kharaim, 28.3. 1983, *Rabiya* (RIY Nr. 8405) - 40 km N Riyadh, 20.3.1969, *Mandaville 2391* (BM). -- Nicht genau lokalisierbar: Arafjan, 26.2.1935, *Muleson 84B* (K) - *8 km W J. Dab*, 22.2. 1968, *Mamdaville 1324* (BM) - Baida Nethilm S'edge of Great Nafud, 18.4.1946, *Vesey-FitzGerald 1586/5* (BM) - 50 km WNW Nariya, 20.3.1968, *Mandaville 1485, 1488* (BM) - Dirab, 8.3.1983, *Al-Rabiyya* (RIY 7647) -

Kuwait: 122 km SW Kuwait City, near Al-Salmi border station, 21.2.1985, *Boulos & Al-Hasan 15011* (BM) - 15 km from Kuweit City to Al-Salmi frontier station, 280 m, 17. 4.1990, *Boulos & Cope 17738* (BM) - Kuwait, 1.5.1935, *Dickson 255A* (K) - dto., III.1935, *Muleson 250* (K) - dto., *Halwagy* (W).

Bahrain Island: near Buri, 13.3.1950, *Good 107* (BM, K) - W of Jebel Dukhan, 21.3.1950, *Good 106* (K).

Oman: Oman, 24.1.1979, *Whitcombe 4078* (RIY).

Syria: Syrian Desert, 33 km SW of Deir-ez-Zor, 30.4. 1933, *Eig & Zohary* (HUJ).

Iraq. Persian Foothills Distr. (FPF): Jebel Hamrin on Baquba-Khanaqin road, 150 m, 11.4.1947, *Gillett & Rawi 7356* (K). -- Lower Jazira District (DLJ): inter Al-Falluja et Wadi Tharthar, 50 km S Samarra, 3.5.1957, *Rechinger 9538* (B, M, W) - 71 km SW of Samarra, 29.3.1963, *Barkley & al. 4733* (K, W) - 94 km NNW Falluja, 4.5.1957, *Rawi 20311* (K) - 85 km NNW Falluja, 4.5.1957, *Rawi 20290* (K) - 70 km NW Falluja, 70 m, 7.4.1961, *Chakravarty & Rawi 30341* (K) - 15 km WNW of Falluja, 55 m, 1.4.1961, *Rawi 30159.B* (K). -- Ghurfa-Adhaim District (DGA): inter Tigris flumen et Jabal Hamrin, 40-50 km E Samarra, 4.5.1957, *Rechinger 9583* (W). -- Western Desert District (DWD): Ubaila, 12 km N Rutba, 620 m, 29.3.1962, *Chakravarty & Rawi 31439* (K) - 2 km E Rutba, 28.5.1957, *Rechinger 12826* (W) - 12 km S Rutba, 4.5.1963, *Barkley 5304* (K, W) - 260 km WNW of Ramadi (Ramadi - Rutba Highway), ca. 500 m, 7.6. 1957, *Rawi 20961* (K) - 235 km W Ramadi versus Rutbar, 7.6.1957, *Rechinger 12653* (W) - 135 km NW Ramadi, ca. 310 m, 6.6.1957, *Rawi 21273* (K) - 102 km W Ramadi, 320 m, 20.4.1959, *Rawi & Nuri 27018* (K) - dto., 6.4.1957, *Rechinger 9793* (B, M, W) - Ramadi, IV.1918, *Graham 78* (BM) - 12 km W of Ukhaidir, 60 m, 17.4.1961, *Rawi 30828* (K) - 112 km W Karbala, 70 m, 18.4.1961, *Rawi 30897* (K) - 50 km WSW Karbala, 55 m, 17.4.1961, *Rawi 30822* (K) - 5 km W of Kerbela, 60 m, 9.3.1947, *Gillett & Rawi 6387* (K) - 16 km W Falluja, *Ckakravarty & Rawi 30283* (K). -- Southern Desert District (DSD): 90 km NNW Shabicha, 330 m, 26.4.1957, *Rechinger 13600* (W) - 15 km SE of Ashuriya (ca. 50 km WNW of Shabicha), 360 m, 26.4.1957, *Guest & al. 19385* (K) & *Rechinger 13616* (W) - Al-Maa'niya, ca. 95 km W of Shabicha, 17.4.1961, *Khatib & Hazim 30563* (K) - 80 km W of Shabicha, 400 m, 12.3.1961, *Chakravarty & al. 30041* (K) - 13 km NW Shabicha, 320 m, 26.4.1957, *Rechinger 13663* (W) - Al-Zarqa, 12 km SW Samawa, ca. 25 m, 30. 3.1957, *Alkas 17679* (K) - Al-Waksa Well, ca. 85 km NW of Salman, 310 m, 25.4.1957, *Guest, Rawi & Rechinger 19217* (K) & *Rechinger 13691* (W) - Al-Ferch, 40 km NW of Salman, 23.4.1972, *Fauzi & al. 38669* (K) - 3 km N As-Salman, 220 m, 24.3.1960, *Rawi & al. 29231* (K) - near Salman, 210 m, 22.4.1957, *Guest, Rawi & Rechinger 18826* (K) - Midway between As-Salman and Aidaha, 20.3.1968, *Alizzi & Omar 35618* (K) - 50 km NW Aidaha, ca. 80 km SSW of Salman, 370 m, 25.4.1957, *Guest & al. 19208* (K) & *Rechinger 9416* (M, W) - nr. Jumaima, ca. 140 km SW of Salman, ca. 390 m, 24. 4.1957, *Guest, Rawi & Rechinger 19098.A* (K) & *Rechinger 13760* (W) - between Ansab and Samah, 22.3.1968, *Alizzi & Omar 35697* (K) - Al-Rikhaimiya, 41 km N of Samah, 230 m, 23.3.1975, *Bot. Staff 42335* (K) - Rumaila station, 8.4. 1933, *Eig & Zohary* (W) - Safwan, 60 m, 26.3.1975, *Bot. Staff 42443* (K) - Khadr-al-Mai enclosure, 190 m, 21.3. 1960, *Rawi & al. 29102* (K) - dto., 16.4.1963, *Khatib & Alizzi 32707* (K) - 20 km S Nukhaila, 17.3.1968, *Alizzi & Omar 35500* (K) - 10 km SSE of Jiraibiyat, ca. 125 km SSW Basra, 175 m, 24.3.1957, *Guest, Rawi & Rechinger 17164* (K) & *Rechinger 14429* (W) - nr. Chilawa, ca. 110 km WSW of Basra, 175 m, 25.3.1957, *Guest, Rawi & Rechinger 17213* (K) & *Rechinger 8797, 14405* (W) - nr. Safai al-Maghif, NE of Ghazlani, ca. 100 km WSW Basra, 130 m, 25.3.1957, *Guest, Rawi & Rechinger 17278* (K) & *Rechinger 14477* (W) - W of Jarishan, ca. 90 km SW Basra, 120 m, 24.3.1957, *Guest, Rawi & Rechinger 17148* (K) & *Rechinger 8774* (W) - Jarishan, ca. 30 km SW Basra, 120 m, 24.3.1957, *Rechinger 8774* (M) - Zubair, 18.3.1957, *Rechinger 15414, 15417* (W) - env. of Jaliba, SW of Ez-Zubair, 8.4.1933, *Eig & Zohary* (HUJ) - 20 km SW Safwan, 24.3.1957, *Rechinger 14489* (W) - 18 km

SSE Zubair, 23.3.1957, *Rechinger 8674* (M, W) - 23 km SE Zubair, 10 m, 23.3.1957, *Guest, Rawi & Rechinger 16868* (K) - 27-46 km WNW Ansab, 137 km S As-Salman, 22.4. 1957, *Rechinger 13802* (W) - Jebel Sanam, 24.3.1957, *Rechinger 8723* (M, W) - Um Qasr, ca. 40 km SSE Zubair, 4 m, 23.3.1957, *Guest & al. 16912* (K) & *Rechinger 8702* (B, M, W) - dto., 2.4.1965, *Alizzi & Khatib 33460* (K). -- Central Alluvial Plain District (LCA): Baghdad, Faluja de-sert, 16.4.1955, *Wheeler Haines 60* (K).

Iran. Prov. Semnan: prope Mulkabad, 64 km SE Karavansarai Shah Abbas, 900 m, 24.5.1974, *Rechinger 46310b* (W). -- Prov. Hormozgan: 10 km ESE of Lar, near village Sartang, 19.4.1983, *Assadi & Sardabi 41994* (TARI). --Prov. Kerman: Djiroft, Djas Muriyan, ca. 400 m, IV.1950, *Starmuehlner 125a* (W) - Jiroft to Sfandagheh, 1700 m, 20.3.1971, *Iranshahr & Termeh 40899-E* (W). -- Prov. Baluchestan: 71 km from Raskan to Chahbahar, 100 m, 8.3.1977, *Runemark & al. 22462* (TARI) - vicinity of Khash, 1290 m, 24.4.1983, *Termeh & al. 41109-E* (W) - 12 km SSE a vico Bazmán, 13.4.1973, *Soják 1906* (PR).

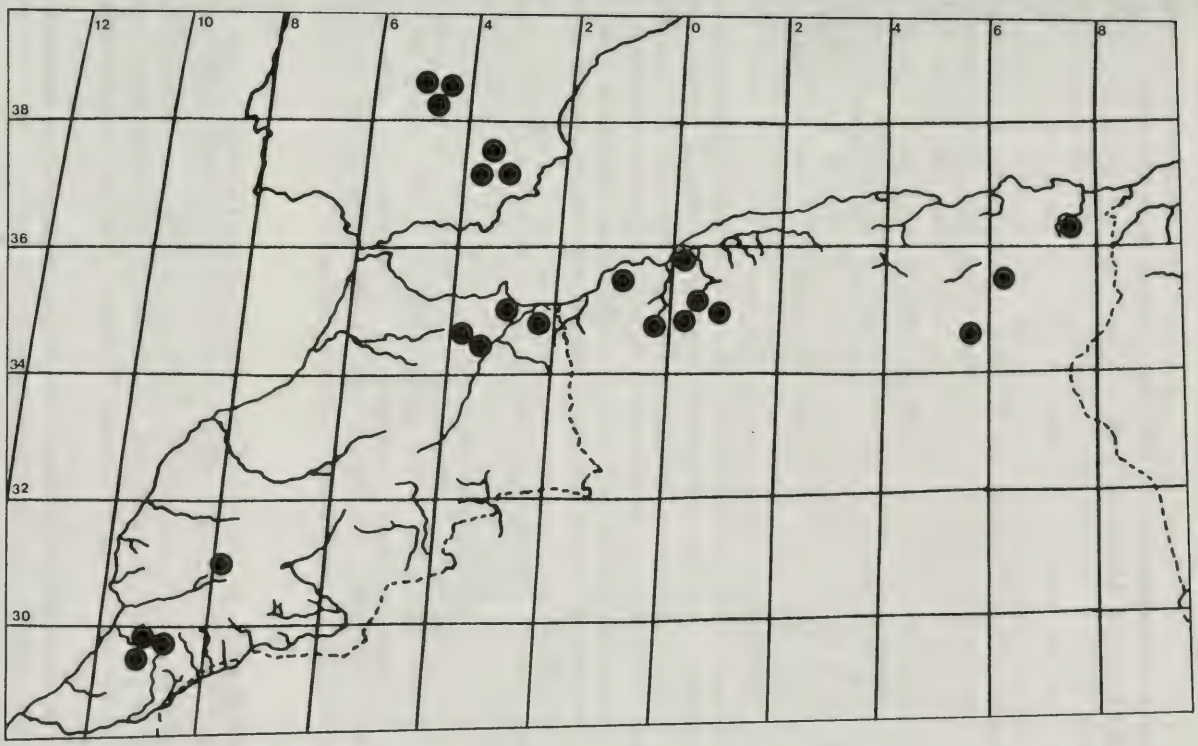
Afghanistan. Prov. Helmand: Wüstenrand bei Mohammad Rahim Qalay, S von Darweshan gegen die Jabbar Oza Dasht, 710 m, 17.4.1972, *Anders 8485* (Hb. PODL.) - Rand der Registan-Wüste 7 km S Baghat (am Helmand), 720 m, 20.5.1967, *Freitag 739* (Hb. FREITAG, Hb. PODL.)

Pakistan. Baluchistan. Makran: 60 km S Panjgur, 800-850 m, 19.4.1965, *Rechinger 28100 Bpp.* (W).

14. Astragalus scorpioides Willd., Sp. Pl. 3: 1280. 1802 ≡ *Tragacantha scorpioides* (Willd.) O.Kuntze, Revis. Gen.: 948. 1891. **Holotype:** Hispania, leg. *Pourret* (B-Willd!).
= *A. canaliculatus* Willd., Enum. Pl. Hort. Berol. Suppl.: 52. 1813. **Lectotype:** (B-Willd!, Microfiche Cat. Nr. 13997).

Figures: ZOHARY, Fl. Palaestina 2, part two: plate 88. 1972.

Plants branched at the base, covered with 0,3-1,2 mm long (only in the fruit partly distinctly shorter) white, sometimes in part also with black hairs. Stems 4-40 cm long, prostrate or ascending, finely striate, sparsely to loosely covered with semipatent to patent white hairs. Stipules whitish to somewhat greenish, 3-5 mm long, narrowly triangular to triangular, acuminate, adnate at a length of 0,5-1 mm to the petiole, otherwise free, covered with white or sometimes also with black hairs. Leaves 3-8 cm long; petiole 0,5-1,5 cm long, like the rachis delicate, sparsely to loosely covered with semipatent to patent hairs. Leaflets in 6-9 pairs, 5-13 mm long and 1-4 mm wide, narrowly elliptic to narrowly obovate, rounded to distinctly emarginate at the apex, glabrous on upper side, sparsely to loosely covered with apressed hairs on lower side. Inflorescences distributed mostly along the whole length of the stem, sessile or with a very short peduncle up to 3 mm long, with 1-2 (-3) flowers. Bracts membraneous, 4-5 mm long, narrowly triangular, ciliate. Flowers sessile. Calyx 6-8 mm long, tubular, loosely to rather densely covered with nearly appressed white, sometimes also with few black hairs; teeth subulate, 4-5 mm long, distinctly longer than the tube. Corolla yellowish or bluish to light violet. Standard 9-11 mm long and ca. 3 mm wide, narrowly elliptic, slightly incised at the apex, narrowed into a cuneiform claw at the base. Wings 8-10 mm long, limb narrowly oblong, obliquely and slightly emarginate at the apex, 4-5 mm long and 1-1,2 mm wide, auricle ca. 0,5 mm long, claw ca. 4 mm long. Keel 7-7,5 mm long, limb obliquely elliptic, with lower edge broadly rectangularly bent in upper part and upper edge nearly straight, rather acute at the apex, 3,5-4 mm long and ca. 1,6 mm wide, auricle indistinct, claw 3,5-4 mm long. Staminal tube straightly cut. Ovary sessile, hairy; style short, rather thick, glabrous. Legume sessile, erect, linear, slightly to distinctly curved to the ventral side, 30-50 mm long, 2,5-3 mm high and 3-3,5 mm broad, weekly keeled on the ventral side, deeply V-like grooved on dorsal side, hence in cross section heart-shaped, ending into a short, mostly hooked beak; valves thin,



Map 11. Distribution of *Astragalus pseudosinaicus*

vaulted, straw-colored to brownish, at first densely covered with appressed hairs 0,05-0,3 mm long and besides with longer, up to 0,7 mm long hairs, later on becoming more and more glabrous, as a rule the longer hairs are disappearing at first. Legume opening at the ventral and the dorsal side, with an narrow septum, but completely bilocular because of the deeply intruding dorsal groove. Seeds 3-3,5 mm long and 2-2,5 mm wide, brown, smooth or slightly wrinkled-pitted.
Flowering time: IV-V. **Occurence:** on dry hills, along roadside, as weed in fields.
Distribution: Spain, Morocco, Algeria. Map 14.

Specimens seen:

Spain. Castilla la Nueva. Prov. Madrid: Madrid, IV. 1841, *Reuter* (K) - dto., IV.1891, *Pau* (W) - dto., Cerro Negro, *Cavanilles* (MA) - dto., V.1799, *Rodriguez* (MA) - dto., 1841, *Reuter* (G) - dto., V.1916, *Vicioso* in SENNEN, Pl. d'Esp. *2947* (BC, G, MA, W, Hb. PODL.) - dto., 600 m, 21.5.1924, *Font Quer*, (BC, MA) et Fl. Iber. sel. *37* (MA) - Talus du chemin de fer à Cerro Negro, près Madrid, *Bourgeau 2125* (G) - Ribazos en el Cerro Negro, V.1965, *Borja* (G, MA) - Getafe, V.1930, *Aterido* (MA) - Alcala de Henares, 22.6.1853, *Isern* (MA). -- Prov. Toledo: 1 km SE Sesena Nuevo, Hänge gegen das Tajo-Tal, 600 m, 4.6.1973, *Podlech 24950a* (Hb. PODL.). -- **Murcia.** Prov. Albacete: près Alcaraz, 6.6.1971, *Charpin 46.E.71* (G). -- **Granada.** Prov. Granada: Alicún de Ortega, 700 m, 11.6.1971, *Fernández-Casas* (MA, SEV) - Guadix, 10.6.1971, *Fernaándes-Casas* (MA). -- Not exactly to locate: ex Hispania misit *Cavanilles* sub nomine *A. subbiflorus* (G).

Morocco. Prov. Nador: Metalza, Ain-Zora, 1.5.1935, *Sennen & Mauricio* (BM). -- Prov. Oudja: Embouchure de la Moulaya, 19.5.1946, *Gerbinot & al.* (MPU) - Beni-Snassen, Berkane, steppe du Moulouya, 14.4.1934, *Sennen & Mauricio 9353* (BM, G, MA, W) - Taforalt, 1934, *Sennen* (MA). -- Prov. Taza: inter opp. Taza et Oudja, pr. Msoun, 450 m, 26.4.1936, *Samuelsson 7123* (K). -- Prov. Marrakech: Dje-bilet près Marrakech, 600 m, 1.4.1921, *Rodié* (MPU). -- Prov. Agadir: Tifernit et Ida Oubakil, distr. de Taze-roualt, 1876, *Mardochée* (P) - Toumalili, partie septentrionale du distr. D'Ida Ouchemlal, 1876, *Mardochée* (P).

Algeria. Wil. Oran: Oran, IV.1850, *Munby 12* (BM, K, P) - au sud d'Oran, IV.1849, *Boissier & Reuter* (G) - Oued Imbert, 22.4. & 10.5.1917, *Faure* (B, M, P) - Vieil-Arzwe, route de Mostaganem, 5.5.1948, *Balansa* (W). -- Wil. Sidi-bel-Abbès: Sidi-bel-Abbès, 1863, *Lefranc* (P) - dto., 1.5. 1876, *Warion 120* (G) - dto., 1.5.1876, *Warion* Pl. atlant. select. *120* (B, P) - dto., 23.4.1876, *Havard* (BM, G) - à Ténira, 11.5.1876, *Warion* (G). -- Wil. Saïda: Saïda, 22. 5.1852, *Cosson* (P). -- Wil. Constantine: vallée du Rummel supérieure à Constantine, 28.5.1840, *Durieu* (P) - plaine de Melila, 17.5.1953, *Cosson* (P). -- Wil. Batna: env. de Batna, V.1857, *Lefranc*, Fragm. Fl. alger. exs. *337* (P).

Syria: de Bosra à Salkhad, 3.5.1934, *Gombault 4054* (P: introduced).

15. Astragalus sesameus L., Sp. Pl.: 759. 1753 ≡ *Stella sesamea* (L.)Med. in Vorl. Churpf. Phys. Ges. 2: 377. 1787 ≡ *Tragacantha sesamea* (L.)O.Kuntze, Revis. Gen.: 948. 1891 ≡ *A. mediterraneus* Bubani, Fl. Pyrenaea 2: 521. 1900, nom. illeg. ≡ *A. sesameus* var. *eu-sesameus* Maire in Jahandiez & Maire, Cat. Pl. Maroc: 408. 1932, nom. illeg. **Lectotype** (here designated): the specimen in the Linnaeus Herbarium No. 926.24 (LINN, micofiche seen!).

(Remark: the above mentioned specimen corresponds in all parts with *A. sesameus* in the current use. It is therefore choosen as the lectotype).

= *A. sesameus* var. *brachycarpus* Moris, Fl. Sard. 1: 526. 1837. **Type:** from Sicily (not seen).

= *A. sesameus* var. *substellaris* Maire in Bull. Soc. Hist. Nat. Afr. Nord 24: 211. 1933. **Lectotype** Mitidja Algeriae circa Sidi-Salem prope Fundouk (MPU!; Iso: P!).

= **?** *A. sesameus* var. *faurei* Maire in Bull. Soc. Hist. Nat. Afr. Nord 20: 180. 1929. **Type:** Maroc, prope urbem Oudjda, *Faure* (not seen).

= ? *A. sesameus* var. *anoectotrichus* Faure & Maire in Bull. Soc. Hist. Nat. Afr. Nord 25:

301. 1934. **Type:** Maroc oriental, Beni-Snassen, Ras Foughal, *Faure* (not seen)
= ? *A. sesameus* f. *peduncularis* Maire & Sennen in Bull. Soc. Hist. Nat. Afr. Nord 27: 222. 1936. **Type:** Maroc oriental, massif des Beni-Snassen à Taforalt, *Sennen & Mauricio* (not seen).

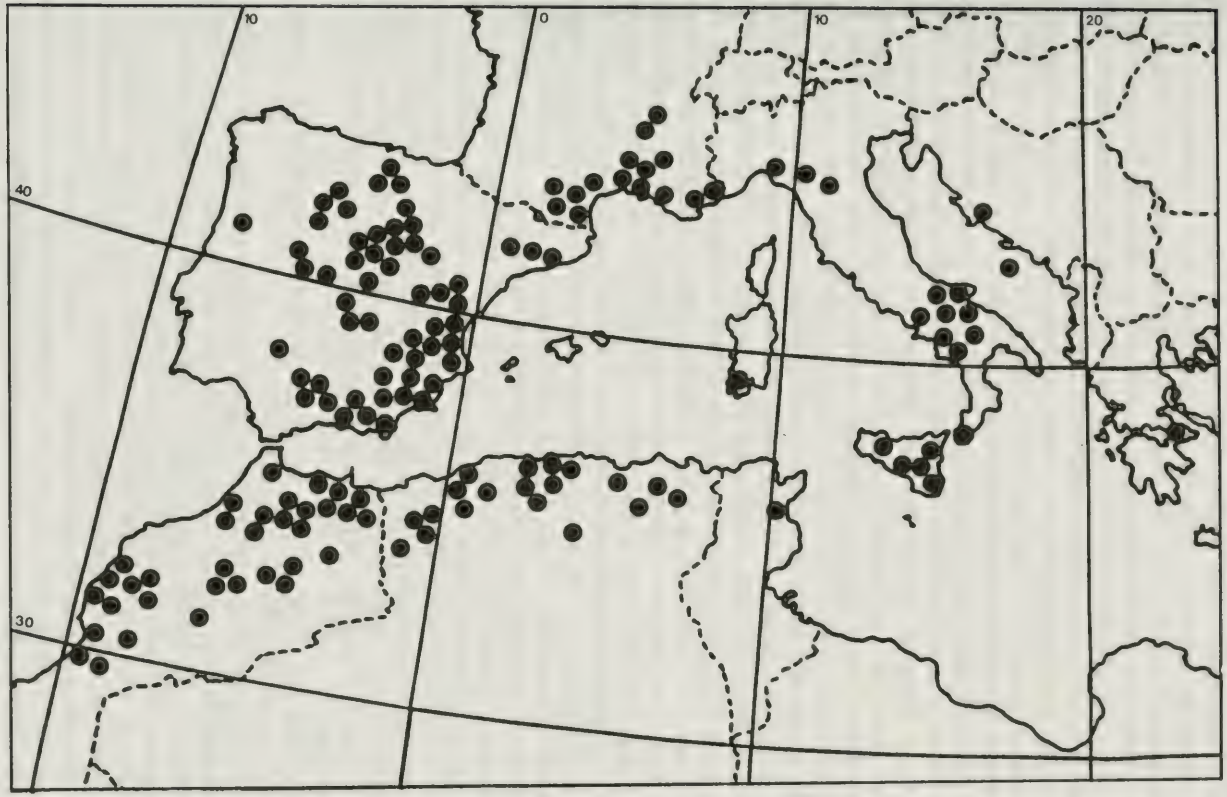
Plants annual, branched at the base, covered with 0,3-1,8 mm long white and mainly in the inflorescence also with black hairs. Stems (7-) 12-36 cm long or sometimes nearly absent, procumbent to ascending, firm, finely sulcate, loosely to rather densely covered with subappressed to partly semipatent white and sometimes with scattered black hairs. Stipules green or whitish with green apex, (3-) 4-6 mm long, triangular acuminate, shortly (1-2 mm) adnate to the base of the petiole, densely covered with subappressed white and black hairs. Leaves 2-8 (-9,5) cm long, petiole 0,4-2 (-2,5) cm long, like the rachis covered with appressed to semipatent white and sometimes also scattered black hairs. Leaflets 6-11 (-12) paired, 3-10 (-14) mm long and 1-3,2 (-5,5) mm broad, oblong to obovate or narrowly elliptic, obtuse or retuse, covered on the upper side sparsely on the lower side more densely with up to 1,1 mm long appressed white hairs. Peduncles absent or up to 0,5 cm long, ± densely white hairy, with 3-10 flowers in a dense spike-like head. Bracts hyaline with green apex, 1-3 mm long, lanceolate, black and white ciliate. Flowers nearly sessile. Calyx 5-7 mm long, campanulate, appressed hairy, with black and white hairs on the tube, teeth linear, unequal in length, 2-3 mm long, black hairy on the surface and white ciliate at the margin. Standard 7-9 mm long and 2-3 mm broad, narrowly elliptic, retuse at the apex. Wings 6,2-7 mm long, limb narrowly oblong, retuse at the apex, 3,2-4 mm long and ca. 1 mm broad; auricle 0,5-1 mm long, claw 3-3,5 mm long. Keel 5-5,3 mm long, limb narrowly triangular-obovate, with lower edge strongly rounded and upper edge only slightly rounded, acute at the apex, with very short auricle. Staminal tube cut at right angle. Ovary sessile, hairy, with short glabrous style. Legumes sessile, erect, linear with widened base, 9-17 mm long, 3-3,5 mm high and 4,5-5 mm broad, slightly carinate ventrally, deeply grooved dorsally, with a very short beak; valves thin, pale brown, covered with two kind of hairs: very short appressed to semipatent hairs of 0,1-0,2 mm length and much longer patent hairs of 1-1,6 mm length. Pods opening at the ventral suture, fully bilocular. Seeds 4-6 (-7) in each locule, 1,2-2 mm long and 1-1,8 mm broad, yellow.
Flowering time: IV-VI (-VII). **Occurence:** Meadows on dry ground, along roadsides, as weed in fields.
Distribution: Spain, France, Italy, Malta, Yugoslavia, Greece, Morocco, Algeria, Tunesia, (Australia: introduced). Map 15.

Specimens seen:

Spain. Galicia. Prov. La Coruña: Puente de Andrada, V.1894, *Vicioso* (MA). -- **Castilla la Vieja.** Prov. Valladolid: Encinas de Esgueva, 12.7.1983, *Alonso 1782* (MA) - Canillas de Esgueva, 17.7.1983, *Alonso 745* (MA). -- Prov. Burgos: Burgos, Oron, 16.6.1918, *Elías* in SENNEN *3346* (G, W) - Bujedo, 14.7.1921, *Elías* in SENNEN *4334* (BC, G, K, W). -- Prov. Palencia: Quintana del Puente, 750 m, 14.5. 1974, *Montserrat* (JACA). -- Prov. Valladolid: Simancas, 6.5.1975, *Montserrat* (JACA). -- Prov. Soria: Velilla de Medinaceli, 850 m, 144.4.1973, *Montserrat* (JACA). -- **Vascongadas.** Prov. Alava: Laguardia, 400 m, 26.5.1983, *Alejandre 1050.83* (MA). -- Prov. Navarra: Puerto de Perdón, 9.6.1975, *Montserrat & de Retz* (JACA) - Bardenas, Piezarey, 290 m, 25.5.1985, *Uribe & al. 1270.85* (MA). -- Prov. Logrono: San-Felices, VI.1930, *Losa* in Soc. Franc. exs. CH.DUFFOUR *6107* (BC) - Arnedillo, 6.8.1972, *Segura Zubizarreta* (M). -- **Aragón.** Prov. Huesca: La Llitera, sobre Baldellou, 560 m, 30.4.1980, *Romo* (BC) - SW de Candasnos, 18.5.1972, *Charpin* (G) - Barbastro, 340 m, 31.5.1984, *Montserrat & al.* (JACA). -- Prov. Zaragoza: San Gregorio, 280 m, 20.5.1984, *Segura Zubizarreta* (M) - Bisimbre, 350 m, 1.5.1973, *Segura Zubizarreta 5394* (G, SEV) - Zaragoza, Finca de Turutlon, 11.5.1979, *Malato-Beliz* (MA) - N of Osera, E of Zaragoza, *Sandwith 4813* (K) Calatayud, 20.5.1910,

Vicioso (B, BC) - Castillo Santía, Erla, 19.6.1955, *Montserrat* (JACA). -- Prov. Teruel: Montalbán, 900 m, 2.7.1957, *Montserrat* (JACA) - Valacloche, 800 m, VI.1893, *Reverchon 484* (B, G, M, W) - 4 km WSW Rubielos an der Straße nach Estación de Rubielos de Mora, 1050 m, 26.5.1988, *Podlech 43971* (Hb. PODL.) - 6 km NNE Manzanera an der Straße nach Sarrión, 1120 m, 27.5. 1988, *Podlech 43987* (Hb. PODL.) - 6 km SE Aguaviva an der Straße von Alcorisa nach Forcall, 510 m, 1.5.1988, *Podlech 44268* (Hb. PODL.) . -- **Cataluna.** Prov. Gerona: Vilarnadal, 20.6.1907, *Sennen* (M). -- Prov. Lerida: Balaguer, 250 m, 23.5.1926, *Font Quer* (BC) - cerca de Alcarràs, 300 m, 17.5.1986, *Carrasquer & al.* (MA) - Cubells, 10.6.1984, *Pedrol* (MA). -- Prov. Barcelona: prope Barcinonem versus Vallvidrera, V.1888, *Tremols* (B) - Barcelona, Putchet, IV.1847, *Bourgeau 257* (G, K) - litoral pres de Barcelone, V.1893, *Tremols* (G) - Tibidabo (Barcelona), V.1910, *Sennen 973* (W). -- Prov. Tarragona: Vallfagona de Riucorb, *Gallardo* (BC) - ad oppidum L'Aleixar, 260 m, 6.6.1954, *Maclans & Batalla* (BC). -- **Castilla la Nueva.** Prov. Guadalajara: Bujeda, *Elias* (BC). -- Prov. Madrid: Campos de Amaniel de la Moncloa, 17.5.1963, *Izco & Demetrio* (SEV) - Escorial, VI.1933, *Ripley 125* (K) - Madrid, *Boissier* (G) - Aranjuez, 21.5.1851, *Lange* (G, MA) - dto., 10.6.1876, *Winkler* (M) - dto., 12.6.1876, *Hackel* (W). -- Prov. Cuenca: Alcócer, 700 m, 15.5.1968, *Montserrat* (JACA) - 14 km S Ademuz an der Straße nach Santa Cruz de Moya, 970 m, 28.5.1988, *Podlech 44079* (Hb. PODL.) - 5 km W Landete an der Straße nach Canete, 1120 m, 28.5.1988, *Podlech 44154* (Hb. PODL.). -- **Valencia.** Prov. Castellón: Segorbe, 2.6.1916, *Pau* (G) - dto., *Reverchon 484* (G, K). -- Prov. Valencia: ad castell. Sagunt, 27.3.1873, Fritze (B) - (Monasterio) Porta-Coeli, VII.1793, *Cavanilles* (MA) - Canals, IV.1792, *Cavanilles* (MA) - Jativa, V.1915, *Beltran* (MA). -- Prov. Alicante: La Marina Baixa, vers Confrides, 1.5.1972, *Maclans* (BC) - Alacant, El Portitxol, 13.4.1971, *de Bolós* (BC) - El Baix Segura, vers Oriola, 27.4.1972, *Maclans* (BC) - Monte San Miguel (Orihuela), 6.5.1962, *Rigual* (MA) - Castillo de Santa Barbara, 2.4. 1954, *Rigual* (MA) - Agost, 11.4.1958, leg. ? (MA) - Sier-ra de la Villa (Villena), 21.4.1962, *Rigual* (MA) - Villajoyosa, *Martínez* (MA) - Sierra de San Julian, 31.5.1959, *Rigual* (MA) - Sierra de San Melian, 11.4.1962, *Rigual* (MA). -- **Murcia.** Prov. Albacete: S.Juan de Alcaraz, 16.6. 1850, *Bourgeau* (G) - Alacaraz, 16.5.1983, *Herranz* (MA) - Minateda SE Hellin, 19.5.1983, *Bayer & al.* (M). -- Prov. Murcia: à Murcia, V.1852, *Bourgeau 1584b* (W) - à Cartagena, 4.4.1851, *Bourgeau 1140* (G, K, W) - 4 km W Puerto Lumbreras an der Straße nach Granada (N 342), 520 m, 19.4.1989, *Podlech 44610* (Hb.PODL.) - dto., 18.4.1968, *Merxmüller & Lippert 23490* (M, Hb. PODL.) - Sierra de la Almarena, SE Lorca bei Purias, 500 m, 24.4.1985, *Conert & al. 96* (Hb. PODL.) - La Hoya, 11.5.1930, *Jerónimo* in SENNEN 7329 (G, W). -- **Andalucia.** Prov. Sevilla: Coripe, sobre Guadalporcú, 30.5.1984, *Aparicio & al.* (SEV) - Morón, 27.4.1933, *Vicioso* (MA). -- Prov. Jaen: Plantae a Sierra Magina, Sierra de Carboneras vert. S, 1560 m, 3.7. 1925, *Cuatrecasas* (BC) - Sierra de Cazorla, 21.5.1952, *Heywood* (SEV). -- Prov. Cadiz: Grazalema, 11.5.1890, *Reverchon 484* (G, K, M, MA, W). -- **Granada.** Prov. Malaga: Le Biscate, 30.4.1919, *Gros* (MA) - Cartama, 19.5.1888, *Reverchon* (G, K) - Marabella, 6.4.1953, *Merxmüller & Wiedmann 583/53* (M) - Malaga, V.1837, *Boissier* (G, W) - dto., 1839, *Salzmann* (G, M) - dto., 1917, *Gros* (BC) - Cerro de los Angeles, 6.5.1919, *Gros* (MA) - Cerro de Antón, 6.5.1919, *Gros* (MA). -- Prov. Granada: La Riscate, c. la Herradura, 30.4.1919, *Gros* (BC) - 5 km E Baza an der Straße nach Velez Rubio (N 342), 820 m, 30.4.1986, *Podlech 42117* (G, LE, LG, TARI, Hb. PODL.) - Granada su colle "Silla del Mora", VII.1848, leg. ? (G) - Granada circa Alhambra, VI.1848, *Funk* (W) - entre Diezma y Purullena, 30.5.1971, *Fernándes-Casas* (MA) - entre Gorafe y Baños de Alicún, 10.6.1971, *Fernándes-Casas* (MA) - Alicún de Ortega, 11.6.1971, *Fernández-Casas* (MA) - Guadix, 10. 6.1971, *Fernándes-Casas* (MA). -- Prov. Almeria: Sierra de Filabres, Sierra de Lucas, V.1902, *Gandoger* (M) - cerca Gergal, 30.5.1971, *Fernández-Casas* (MA, SEV) - Sorbas, 9.5.1921, *Gros* (BC, MA) - ad Sierra Alhamilla, 100-200 m, IV.1890, *Porta & Rigo 254* (B, G, W) - 4 km E El Pozuelo an der Straße von Motril nach Almeria (N 340), 4.4.1986, *Podlech 39893* (G, LE, RSA, TARI, Hb. PODL.) - Almeria, 24.4.1928, *Ellmann & Sandwith 1215* (K).

France. Dept. Haute-Garonne: Toulouse, 1855, *Daenen* (G). -- Dept. Pyrénées-Orientales: Perpignan, 1829, *Endress* (K). -- Dept. Aude: Narbonne, *Pourret* (G). -- Dept. Hérault: Béziers, 20.5.1854, *Post - dto., VI.1855, Personnat* (G) - dto., 6.5.1891, *Sennen* (G) - route de Béziers à Carcassonne près de Nissan, 1857, *Blanc* in Fl. Gall. Germ. ed. BILLOT *2047 B* (G) - Tertres, à Béziers, V,VI.1855, *Blanc* in Fl.Gall.Germ. ed. BILLOT *1857* (B, G) - Monspelii [= Montpellier] spont., *Delile* (G) - Montpellier, bois de la Colombière, 21.4.1901, *Mandon* (W). -- Dept. Hautes-Alpes: Pont de Chabestan, 10.6.1897,



Map 15. Distribution of *Astragalu sesameus*

Girod (G). -- Dept. Vaucluse: Avignon, *Requien* (G) - dto., 1835, *Maire* (G). -- Dept. Bouche-du-Rhône: Martigues, V.1874, *Anthemar* (G) - Pas-des-Lanciers, 20.6.1872, *Roux 1442* (G) - dto., VI.1876, *Marticues* (G) - dto., VI.1876, *Autheman* (B) - Aix en Provence, plateau de la Keirie, V.1884, *Willmott* (K) - Aix, à la butte St.-Eutrope, IV.-V.1888, *Bruyas* in Fl.sel.exs. CH.MAGNIER *1928* (G, MA, W) - Aix-en-Provence, butte des Trois Moulins; Moulin de la Tarse, 19.5.1889, *Bruyas* in Soc.Dauph. *74* (G) - Marseille, VI.1849, *Brébisson* (G) - près de Lazaret de Marseille, 16.& 20.4.1847, *Kralik* in Fl.Gall.Germ.exs. *1044* (G, K) - St. Tronc près Marseille, 5.5.1853, *Roux* (G) - vallon des Enves à St. Antoine près Marseille, 13.6.1879, *Rouy* (G) - St. Henry près Marseille, 24.5.1855, *Roux* (G) - Marseille à Arenc, *Jordan* (K) - Marseille, à Nioula-Bas, 30 m, 20.6.1905, *Verguin* (B). -- Dept. Var: Toulon, *Daenen* (G) - Draguignan, 1910/1911, *Girod* (G). -- Dept. Alpes-Maritimes: ad castellam Nicaeense Pedem. [= Nice], V.1853, *Huet de Pavillon* (G) - Monaco, 3.4.1869, *Joad* (K).

Italia. Lombardia. Prov. Verona: Verona, IV.1834, *DeNotaris* (W). -- **Liguria.** Prov. Genova: Granarola a Genua, *DeNotaris* (K) - Porta degli Angeli, Genova, V.1855, *Calden* (K) - dto., 30.4.1870, *Joad* (K). -- **Toscana.** Prov. Firenze: Trespiano pr. Florent., 9.6.1887, *Sommier* (B, M, MA, W) - Pian di S.Bartolo pr. Firenze, V.1891, *Martelli* (M, W) - dto., 29.5.1890, *Bergeest* (M). -- **Campània.** Prov. Napoli: env. de Naples [= Napoli] à Sortici, *Reynier* (G) - Isola di Capri, Anacapri, V.1932, *Baschant* (B) - Isola di Capri, Punta di Tragara, 13.5.1898, *Kuegler* (B). -- Prov. Salerno: Cap Palinuro, 6.6.1968, *Podlech* (Hb. PODL.). -- **Umbria.** Prov. Perúgia: Lago di Trasimeno, Punta Bella, IV.1960, *Merxmüller 4/60* (M). -- **Pùglia.** Prov. Foggia: Gargano, ad lacum di Lesina, 8.6.1874, *Porta & Rigo* (K) - Monte Sant'Angelo, 19.4.1952, *Harries & Doppelbaur 3230* (M) - Mte. Gargano, 7 km N Mattinata an der Straße nach Vieste, 23.4.1964, *Lippert & Zollitsch* (M) - Mte. Gargano, Südabfall gegen Manfredonia an der Straße nach Ruggiano, 450 m, 21.4.1964, *Podlech 9596* (Hb. PODL.) - Siponto nahe Manfredonia, 18.4.1982, *Angerer* (M) - Manfredonia, 21.5.1972, *Hein* (B) - 16 Km W Manfredonia an der Straße nach Foggia, 130 m, *Hertel 3505* (M). -- **Basilicata.** Prov. Potenza: Potenza, prope Basento flumen, 21.5.1922, *Gavioli* (MA). -- **Calàbria.** Prov. Cosenza: Straße von Frascineto nach Villapiana Scalo, 4.6.1979, *Poelt & Pittoni* (M). -- Prov. Reggio di Calabria: Reggio di Calabria, *Thomas* (G) - Caredia N Melita di Porto Salvo, 22.4.1965, *Merxmüller & Wiedmann 20213* (M). -- **Sardinia.** Prov. Cagliari: prope Cagliari, *Müller* (M, W). -- **Sicilia.** Prov. Palermo: Palermo, 1.5.1895, leg. ? (M) - dto., *Hueguenin* (B) - Misilmeri, X.1841, *Parlatore* (G). -- Prov. Agrigento: Girgenti [= Agrigento], 4.8.1904, *Spencer* (M). -- Prov. Catania: SW Catania, 11.4.1966, *Doppelbaur 16267* (M). -- Prov. Siracusa: supra auriculam Dyonysii prope Syracusa, 9.4.1856, *Huet du Pavillon* (G).

Malta: in aggeribus Florianae, IV.1931, *Borg* (K) - Insula Gaulos, 11.4.1874, *Duthie* (K).

Yugoslavia. Dalmatia: Insula Lessina [= Hvar], *Lagger* (K) - dto., Napoleonberg, 3.5.1911, *Bornmüller* (B) - Lesina [bei Spalato], 7.4.1908, *Schneider* (G, W) - Spalato [= Split], IV.1875, *Studnicka* (K, M, W) - St. Giorolomo bei Spalato, V.1870, *Pichler* (B) - Monte Marian bei Spalato, 14.5.1868, *Pichler* (G, W) - inter Spalato et Salona, V.1880, *Pichler* (K) - Salona, 17.5.1910, *Ronniger* (W) - Solin near Spalato, 21.4.1935, *Jackson & Turrill 151* (K) - Selenico, Fort Sv. Istvan, 13.6.1927, *Korb* (W).

Greece. Sterea Ellas. Nom. Viotía: Delphi, 28.4.1931, *Samuelsson & Zander 233* (G). -- Nom. Atiki-Piréas: Hymettus, *Spruner* (G) - dto., V.1936, *Atchley* (K).

Morocco. Prov. Tetouan: 20 km SW Chefchaouene an der Straße nach Ouezzane (P 28), 170 m, 14.5.1989, *Podlech 46719* (Hb. PODL.). -- Prov. Al-Hoceima: pr. Targuist, 950 m, 30.5.1927, *Font Quer 325* (B, BM, G, MA, MPU). -- Prov. Nador: Melilla, Sidi-Musa, 8.3.1930, *Mauricio* (BM) - Beni-Sidel, Segangan, 24.5.1934, *Sennen & Mauricio* (MPU) - 3 km WNW Zaio an der Straße nach Nador (P 27), 120 m, 12.4.1987, *Podlech 42167* (Hb. PODL.). -- Prov. Oudja: Berkane, 2.4.1934, *Sennen & Mauricio* (BM) - Beni-Snassen, Martimprey-du-Kiss, 18.4.1929, *Faure* (MPU) - Col du Guerbouz, 5.5.1954, leg. coll. Eaux & Forêts *10* (MPU) - 25 km NE Taouirt nahe der Straße nach El Aioun (P1), 13. 4.1987, *Podlech 42251* (G, Hb. PODL.) - Debdou, 3.4.1928, *Wilczek & Dutoit 341* (K) - dto., 2.4.1928, *Wilczek & Emberger 32* (G). -- Prov. Meknès: 20 km NW Meknès an der Straße nach Sidi-Slimane, 430 m, 26.4.1986, *Podlech 41839* (G, LE, Hb. PODL.) - Oued Mellah, E Meknès, 20.4.1941, *Sauvage 1298* (MPU). -- Prov. Fes: 6 km NE Ain-Taoujdate an der Straße von El-Hajeb nach Fes (S 310), 500 m, 25. 4.1986, *Podlech 41779* (Hb. PODL.) - Aïn Cheggag, IV.1913, *Pitard 2279* (MPU) - Mittlerer Atlas, 2 km S Immouzer des Marmoucha an der Straße nach Boulmane (4656), 1610 m, 27. 6.1989, *Podlech 47166* (Hb. PODL.). -- Prov. Taza: Taza, 700 m, III.1923, *Braun-Blanquet*

(MPU) - dto. 21.3.1923, *Maire* (MPU) - Taza, Oued Taza, 27.4.1936, *Samuelsson 7135* (B) - Taza, Oued Termas, 24.5.1929, *Jahandiez 277* (BM, G) - Ain-Hamma, 1140 m, 25.5.1981, *Castroviejo & al.* (G, MA) - Msoum, inter Taza et Oudja, 450 m, 26.4.1936, *Samuelsson 7124* (B). -- Prov. El-Jadida: Chichaoua, 5.4.1921, *Maire* (MPU) - Settat, 300 m, 6.4.1929, *Maire* (MPU) - 20 km E Settat an der Straße nach Benahmed (S 115), 400 m, 6.5.1989, *Podlech 46054* (Hb. PODL.). -- Prov. Safi: 18 km N Essaouira, Gorge du Chicht, 100 m, 30.3.1974, *Miller & al. 283* (BM) - 10 km S Tamanar an der Straße von Essaouira nach Agadir (P 8), 340 m, 7.4.1986, *Podlech 40086* (G, LE, RSA, Hb. PODL -- Prov. Marrakech: 32 km from Marrakech to Chamaia, 450 m, 7.4.1972, *Davis 54127* (BM) - 3 km S Sidi-Bou-Othmane an der Straße nach Marrakech, 580 m, 6.5.1989, *Podlech 46024* (G, HUJ, LE, P, TARI, Hb. PODL.) - Amizmiz, 30.5.1936, *Balls 2475* (BM, K) - in convalle Reraïa, prope Asni, 1250 m, 4.6.1926, *Lindberg 3579* (B) - Asni, 23.4.1936, *Simpson 36.1162* (BM) - 4 km N Asni an der Straße nach Marrakech (S 501), 1150 m, 4.5. 1989, *Podlech 45862* (G, Hb. PODL.) - Reraira, 4000-5000', V.1871, *Hooker* (K) - dto., 12.3.1875, *Maw* (G) - 8 km SW Ait Ourir nahe der Straße nach Tnine-de-l'Ourika, 880 m, 20.4.1986, *Podlech 41225* (Hb. PODL.). -- Prov. Beni-Mellal: Kasba Tadla, 450 m, 30.4.1921, *Jahandiez 231bis* (G) - Beni-Mellal, 1939, *Allinson* (BM) - Mittlerer Atlas, 8 km NW Bin-e-Ouidane an der Straße nach Afourer (S 508), 930 m, 23.4.1986, *Podlech 41584* (G, Hb. PODL.) - 3 km SW Cascades d'Ouzoud, 1150 m, 23.4.1986, *Podlech 41505* (G, Hb. PODL.). -- Prov. Agadir: 25 km N Agadir, coast road, 31.3.1974, *Miller & al. 371* (BM) - Sousse, 12.5.1896, *Murbeck* (BM) - Prov. Taroudant: Hoher Atlas, 17 km von der Hauptstraße Taroudant - Ouarzazate (P 32) gegen den Tizi-n-Test (S 501), 1140 m, 3.5.1989, *Podlech 45721* (Hb.PODL.) - Anti-Atlas, 39 km SE Ait Baha an der Straße nach Tafraoute (S 509), 1220 m, 29.4.1989, *Podlech 45499* (Hb. PODL.) - 3 km N Irherm, 1650 m, 2.4.1972, *Davis 53987* (BM) - 3 km W Souk-el Arba-du-Sahal an der Straße von Tiznit nach Sidi-Ifni (7064), 120 m, 1.5.1989, *Pod-lech 45667* (Hb. PODL.). -- Prov. Ouarzazate: 2 km E Taliouine, 1130 m, 16.4.1986, *Podlech 40973a* (G, LG, Hb. PODL.). -- Prov. Er-Rachidia: Akeimeden,versant N au desus de la ME de Midkane, 2100 m, 9.6.1980, *Charpin & al. 723* (G).

Algeria. Wil. Tlemcen: sur la route de Nedroma à Nemours, 14.4.1925, *Faure* (BM, W) - Tlemcen, Mansourah, 23.5.1904, *Faure* (G) - Ghar-Rouban, IV.1855, *Munby* (K) - dto., *Pomel* (MPU). -- Wil. Sidi-Bel-Abbès: Sidi-bel-Abbès, 1.5.1876, *Girardet* (BM) - dto., 14.4.1879, *Moreau* (G). -- Wil. Oran: env. d'Oran, 28.3. & 14.4.1908, *Faure* (G) - Oran, *Munby* (G) - dto., 18.4.1856, *Bourgeau* (MPU, P) - dto. à Santa-Cruz, 1.5.1913, *Faure* (BM, M) - dto., 12.4. 1913, *Pitard* (G) - Oran, Djebel Santo, 16.4.1883, *Devaux* (G) - Oran, Ain-ben-Khelil, 30.4.1856, *Cosson* (BM) - Oran, Oued Imbert, 6.4.1930, *Faure* (BM, K) - dto., 22.4.1917, *Faure* (M) - Oran to Misserghin, 100-200 m, 27.4. 1971, *Davis 51658* (BM). -- Wil. Saïda: Tiffrit près Saïda, 6.6.1936, *Faurel* (MPU) - Ain Sefra, V.1922, *d'Alleizette* (P). -- Wil. Chlef: S.-Cyprien-des-Attafs, rives du Chelif, 15.6.1896, *Chevallier* (MPU, P) - Miliana, *Pomel* (MPU). -- Wil. Blida: au-dessus de L'Emic, point W Cherchell, 23.4.1962, *Charpin* (G). -- Wil. Tiaret: Pont du Caia near Teniet el Had, 1.5.1937, *Simpson 37.1290* (BM). -- Wil. Alger: Alger, 1838, *Bové 72* (G) - dto., IV.1878, *Battandier* (G) - dto., *Bourlier* in Fragm. Fl. alg. exs. *518* (BM, G, P, W) - Alger, entre Hussein Deir et Maison Carrée, 25.4.1883, *Meyer* (BM) - Birmandreis (près Alger), 27.3.1893, *Chevallier* (P). -- Wil. Béjaia: Bougie [= Béjaia], V.1896, *Reverchon* (P) - 3 km S Béjaia, 28.4.1971, *Davis 52945* (BM) - Kerrata, 800 m, VI.1897, *Reverchon 267* (G, P). -- Wil. Sétif: half way between Sétif and Kerrata, 1000 m, 21.5. 1971, *Davis 52553* (BM) - 12 km from Djemila to Fedj-M'Zala, 850-950 m, 23.5.1975, *Davis 58213* (BM). -- Wil. Constantine: Constantine, IV. 1888, *Girod* (G) - dto., m. Mansourah, 26.4.1870, *Paris 437* (BM, P). -- Wil. Laghouat: à Aflou, 29.4.1888, *Clary* (MPU, P). -- Wil. Batna: Col de Telmet NW Batna, 1890 m, 21.4.1937, *Alston & Simpson 286* (BM) - Djebel Tougour près Batna, 22.5.1853, *Cosson* (P) - E Batna, *Lefranc* (P) - Djebel Cheliah, Mtes. Aurès, 11.6.1853, *Cosson* (MPU, P) - El Kantara, 26.5.1853, *Cosson* (P).

Tunesia. Gouv. Zaghouan: Tuburba près Tunis, 6.5.1883, *Cosson & al.* (K, P). -- Nicht genau lokalisierbar: Ghar-diman, 16.5.1884, *Ross* (M).

Australia. South Australia: Spring Dam, Stn., via Yunta, 9.9.1973, *Tiver* (B) [introduced, known since 10 years according to label].

16. Astragalus sesamoides Boiss., Diagn. Pl. Or. 9: 59. 1849 ≡ *Tragacantha sesamoides* (Boiss.) O.Kuntze, Revis. Gen.: 948. 1891. **Holotype:** In regno Cabulico, *Griffith 1096* in Herb. HOOKER (K!; Iso: *Griffith Journ. no. 1159*, G-BOIS!).
= *A. stella* L. var. *longistipulatus* O.Kuntze in Trudy Imp. St.-Petersburgsk. Bot. Sada 10: 84. 1887. **Type:** Turkmenen-Steppe, *O.Kuntze* (non vidi).

Figures: Flora Uzbekistana 3: 573, tab. 63, fig. 3. 1955.

Plants simple or branched at the base, sparsely covered with thin, soft, white hairs, near the stipules and in the inflorecence rarely in other parts of the plant also with black hairs. Stems 7-36 cm long, ascending, finely sulcate, sparsely covered with appressed, 0,3-1 mm long hairs. Stipules whitish to greenish, 3-4 mm long, narrowly triangular to triangular, acuminate, adnate at a length of 0,5-1 mm to the petiole, otherwise free, ciliate at the margin or sparsely covered with black and white hairs. Leaves 2,5-5,5 cm long; the petiole 0,3-1 cm long, like the rachis thin, covered with subappressed 0,3-0,8 mm long white or also scattered black hairs. Leaflets 4-6 paired, 4-15 mm long and 2-5,5 mm broad, narrowly oblong to narrowly elliptic, rounded to obtuse or slightly retuse at the apex, upper side sparsely covered with appressed hairs or sometimes glabrous, lower side more densely hairy. Inflorescences with a 2-6 cm long, finely sulcate peduncle, covered with subappressed to semipatent white hairs, towards the inflorescence also with more and more black hairs. Flowers (2-) 3-9 in a rather dense head. Bracts membraneous, 2-3 mm long, narrowly triangular, white and black ciliate. Pedicels up to 0,5 mm long. Calyx 5,5-7 mm long, campanulate, covered at the base with white and black up to 1 mm long hairs, toward the teeth with more and more black and somewhat longer and more patent hairs; teeth subulate, 3-4 mm long, longer than the tube. Corolla violet. Standard 5,5-7 mm long and 2-2,5 mm wide, narrowly elliptic, slightly retuse at the apex, at the base contracted into a narrow claw. Wings (4-) 4,5-5 (-5,5) mm long, limb narrowly oblong, obtuse at the apex, 2-2,5 mm long and 0,8-1 mm broad; auricle ca. 0,5 mm long, claw 2-2,5 mm long. Keel 4-4,5 mm long, limb triangular-obovate, with lower edge strongly curved and upper edge slightly rounded, acute at the apex, 1,5-1,8 mm long and 1-1,2 mm broad; auricle very short, claw 2,2-2,7 mm long. Staminal tube ending with a curved line. Ovary subsessile, densely appressed hairy; style short, glabrous. Legumes shortly stalked, erect, straight, linear-oblong, with rounded base, 12-15 mm long, 3-3,3 mm high and 3,5-4 mm broad, carinate at ventral side, deeply grooved on dorsal side, ending into a 1-1,5 mm long reflexed beak; valves nearly flat, covered with subappressed to semipatent white, up to 1,3 mm long hairs. Pod opening at the ventral suture, septum ca. 1 mm broad, but fully bilocular because of the deeply intruded dorsal groove. Seeds 4-6 in each locule, 1,5-1,8 mm long and broad, yellow, smooth.
Flowering time: IV-VI. **Occurence:** as weed in fields, along roadsides, in steppe and semi-desert regions, on loess and sandy soil.
Distribution: Kazakhstan, Uzbekistan, Turkmenistan, Tadzhikistan, Iran, Afghanistan. Map 16.

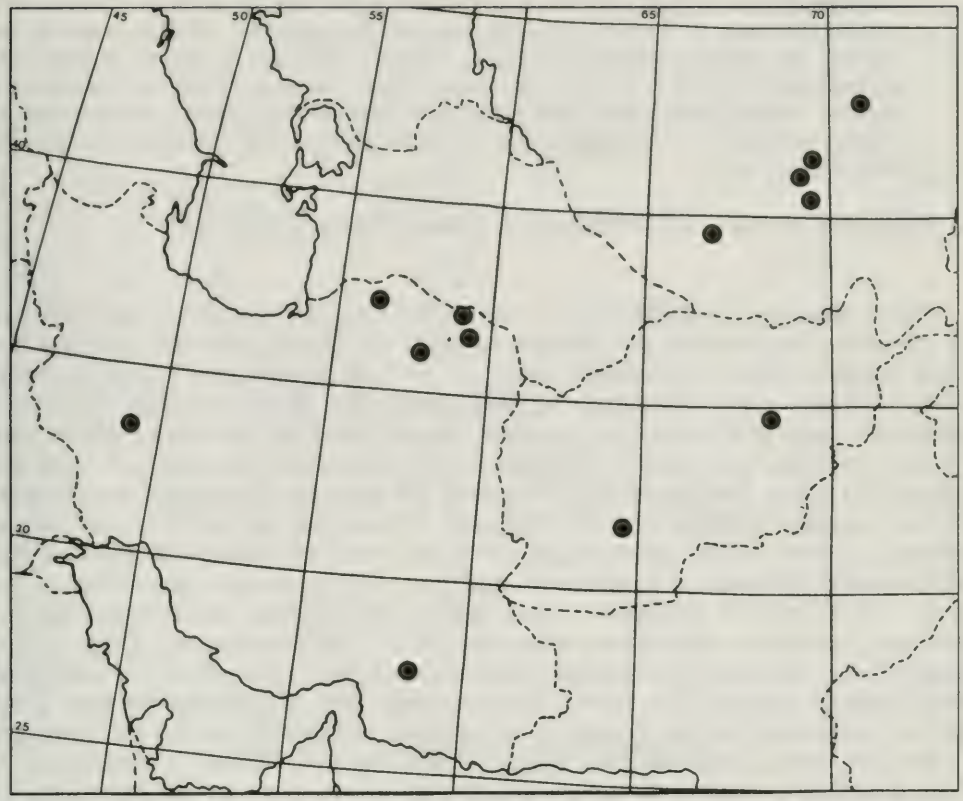
Specimens seen:

Kazakhstan. Prov. Juzhno-Kazakhstan: Karatau, prope Ters, 13.6.1931, *Pavlov 180* (B). -- Prov. Dzhambul: rami austro-orientale montium Karatau Syrdariensis, montes Ulkun-Burul, 19.5.1963, *Goloskokov* in Herb. Fl. SSSR *4471* (B, BM, G, K, M, W, Hb. PODL.).

Turkmenistan. Badghyz, Kuschk valley, at Alekspevka, 25.3.1912, *Michelson 378* (LE).

Uzbekistan. Prov. Samarkand: S Samarkand, Jangi Aryk, 700 m, 22.5.1974, *Vasàk* (G). -- Prov. Tashkent: in loco Kak-Pak dicto, 22.5.1922, *Korovin* in Herb. Fl. As. Med. *17b* (B, G, K, MA, W).

Tadzhikistan. Prov. Leninabad: Montes Mogoltau, in valle Utsch-bach, 6.5.1924, *Popov & Vvedensky* in Herb. Fl. As. Med. *17a* (B, G, K, MA, W) - N'slopes Turkestan range, Pereval (pass)



Map 16. Distribution of *Astragalus sesamoides*

Schachristan, 8.7.1965, *Tscherepanov & al. 1126* (K).

Iran. Prov. Khorasan: Golestan Park, Almeh, 1100 m, 8.5.1984, *Maassoumi 47557* (TARI, Hb. PODL.) - between Ghoochan and Darreh Gaz, Tandooreh National Park between Shekarb and Chehelmehr, 1600-1900 m, 28.5.1984, *Maassoumi 50670* (TARI) - Kuh-e Nishapur, Darreh Abshar supra Akhlomat, 1600-1800 m, 30.5.11948, *Rechinger & al. 4557b* (W) - Montes Hazar Masdjid, inter Ardak et Tolgor, 1200-1600 m, 7.-10.6.1948, *Rechinger & al. 4913* (W). -- Prov. Lorestan: Durud [= Dow Rud], 5000', 22.5.1940, *Koelz 15732* (W). -- Prov. Kerman: Distr. Djiroft, Djas Muriyan, ca. 400 m, IV.1950, *Starmuehlner 125* (W).

Afghanistan. Prov. Takhar: Taluqan, 720 m, 27.4.1965, *Podlech 10300a* (Hb. PODL.). -- Prov. Bamian: Erak, III.1862, *Griffith* Journal No. *1159,* Hooker No. *1096,* Distr. no. *1510, 1549* (G-BOIS, K). -- Prov. Kandahar: 10 km E der Straßengabelung Kandahar-Girishk-Lashkargah, 900 m, 21.4.1972, *Anders 8670b* (Hb. PODL.) -- Prov. Helmand: desert. Registan pr. Bhagat, 600 m, 19.5.1967, *Rechinger 34623* (W).

17. Astragalus sinaicus Boiss., Diagn. Pl. Or. Nov. 9: 57. 1849. Typus: *Aucher 1309* ex parte ≡ *A. pseudostella* Boiss., Fl. Or. 2: 225. 1872, nom. illeg. **Holotype:** 'Sinai', *Aucher 1309 pp.* (G-BOIS!)

Remark: *A. sinaicus* never has been found in Sinai or in other parts of North Africa. The examination of the type has led EIG, Syst. Stud. Astrag. Near East: 9. 1955 to the following

conclusions: "The original specimens of *A. sinaicus* do not come from Sinai. The label of the original specimens of BOISSIER, it is true, bears the inscription 'No. 1309, in montibus Sinai Deserti'. The following number of AUCHER's collection, 1310, also *A. sinaicus*, is from Chios, the vegetation of which is purely Mediterranean. When examining the original specimen of *A. sinaicus*, I found attached to it a fruit of *Medicago coronata*. This species is Mediterranean and does not occur in Sinai. My opinion is that the original specimen of *A. sinaicus* comes from Chios and not from Sinai."

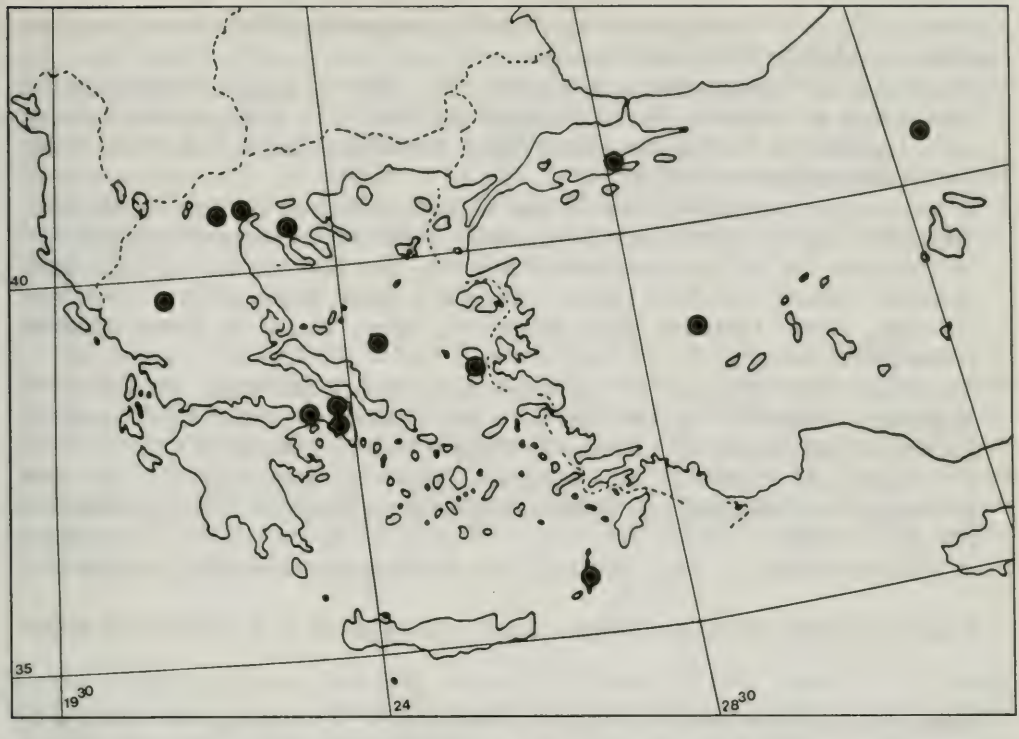
Figures: DE STEFANI, FORSYTH MAJOR & BARBEY, Samos: pl. 11. 1892.

Plants annual, branched at the base, covered with 0,3-1,4 mm long, rather rigid white hairs, at the nodes, stipules and in the inflorescence, rarely also on the leaves with additional black hairs. Stems prostrate or sometimes erect, 5-25 cm long, covered with 0,3-1,2 mm long ± patent or rarely subappressed hairs. Stipules greenish, 4-5 mm long, triangular acuminate, adnate at a length of 0,5-0,8 mm to the petiole, connate behind the stem into a ± distinct sheath up to 1 mm long, covered with subappressed white and in part with additional black hairs. Leaves (1-) 2-7 cm long; petiole 0,5-1,5 cm long, like the rachis covered with semipatent 0,3-1,1 mm long hairs. Leaflets (5-) 8-10 (-12) paired, 2-10 mm long and 0,8-4 mm wide, narrowly elliptic or elliptic, obtuse or slightly retuse at the apex, both sides with appressed hairs. Inflorescences subsessile or sometimes in upper part of the stem with a peduncle up to 5 cm long, with 3-7 flowers head-like crowded. Bracts 1-2,5 mm long, membraneous, narrowly triangular, acuminate, white or black and white ciliate. Flowers nearly sessile. Calyx 4,3-6 mm long, tubular, covered with ± appressed white hairs and black hairs only at the teeth or with black hairs all over the tube; teeth 1,3-1,6 mm long, much shorter than the tube. Corolla yellow, violet or pale mauve. Standard 6-8,2 mm long, narrowly elliptic, 2-3 mm wide, retuse at the apex, with an indistinct claw. Wings 5-7 mm long, limb narrowly oblong, 2,8-3,2 mm long, 1 mm wide, obtuse at the apex, with auricle ca. 0,5 mm long, claw 2,3-3 mm long. Keel 4-5 mm long, limb triangular-obovate, with lower edge in apical part strongly bent and upper edge slightly rounded, obtuse at the apex, 1,5-1,8 mm long and 1,1-1,2 mm wide, auricle very short, claw 2-3 mm long. Staminal tube cut at ± right angle. Ovary sessile, hairy; style ca. 1 mm long. Legume nearly sessile, ± erect, narrowly oblong to obovate, straight or slightly curved upwards, slightly widened and bigibbous at the base, with acute apex, 6-18 mm long, 2,5-4 mm high and 2-3,5 mm broad, carinate ventrally, with a deep and narrowly V-shaped groove on the dorsal side, covered with two kind of hairs (double indumentum): with short, subappressed or mixed with slightly semipatent 0,1-0,2 mm long hairs and with much longer semipatent to patent, often slightly curved, up to 1,2 mm long hairs which are often inserted on small tubercles. Pod opening along the ventral suture, completely septate. Seeds 5-7 in each locule, 1,1-1,5 mm long and 0,9-1,2 mm wide, brown, smooth.
Flowering time: III-V. **Occurence:** in mediterranean vegetation types at lower altitudes.
Distribution: Yugoslavia, Greece, Turkey, Cyprus. Map 17.

Specimens seen:

Yugoslavia. Bosnia: Tanandia, 15.5.1891, *Nadji* (P). -- Macedonia: in fauce Tobolka-Schlucht, 200-300 m, VI.1918, *Burgeff 611* (B, M) - Krivolak, 22.5.1918, *Burgeff 446* (M) - ad Makri, V.1903, *Adamovic* (K).

Greece. Makedonia. Nom. Imathía: pag. Fetitza prope Naoussa, *Dimonie* (M, W). -- Nom. Thessaloniki: Saloniki, 18.5.1892, *Caherrel* K, M, W) - dto. IV.1905, *Adamovic* (W) - 10 km N Saloniki, 13.4.1917, *Turrill 10* (K). -- Nom. Haldiki: peninsula Cassandra, 4.5.1890, *Heldreich* (K). -- **Thessalía.** Nomos Magnissía: Sesklo, W Volos, 150 m, 12.5. 1974, *Raus* (Hb. PODL.) - Insula Skopelos, IV.-V.1896, *Leonis* (G, W). -- **Stereá-Eláda.** Nom. Atikí-Piréas: M. Megara, *Atchley 1341*



Map 17. Distribution of *Astragalus sinaicus*

(K) - prope Athenas, IV.1856, *Heldreich* (K) - dto., 22.4.1884, *Heldreich* in Herb. Graec. Norm. *843* (G, K, M, W) - Hymettus, *Spruner* (W) - in mt. Hymettos, 25.4.1878, *Heldreich* (G-BOIS) - in collibus maritimis Piraei, 27.3.1878, *Heldreich* (W) - Vuliagmeni, III. 1933, *Guiol* (MA) - 2 km S Loutsa, 2.4.1979, *Greuter & Merxmüller 16859* (B, M) - Marathon, 16.5.1875, *Heldreich* (G-BOIS) - insula Megali-Kyra, 8.4.1878, *Heldreich 421* (G-BOIS, M, W) - Kap Sunion, 1861, *Spruner* (G-BOIS) - dto., 25.4.1873, *Heldreich* (G-BOIS) - dto., 15.4.1954, *Merxmüller & Wiedman 281/54* (M). -- **Nissiá Egeou.** Nom. Kikládes: ins. Kythnos, IV.1901, *Heldreich* (M) - ins. Syros, 10.4.1889, *Heldreich & Halácsy* (G, K, W). -- Nom. Híos: Chios, *Aucher 1309 pp., 1310* (G-BOIS, K, P, W). -- Nom. Sámos: Sámos, 16.5.1888, *Forsyth Major 862* (G, K). -- Nom. Dodekánissa: insula Karpathos, Pigadia, 13.4.1883, *Pichler* (G-BOIS).

Turkey. Prov. Bursa: Mudanya, 12.5.1899, *Bornmüller 4381* (G, K, W). -- Prov. Denizli: Pamukkale N Denizli, 7.5.1969, *Fitz & Spitzenberger 409a* (W). -- Prov. Tokat: inter Amasya et Tokat, ad Tschengel-han, V.1889, *Bornmüller 208* (BM, G, K)

Cyprus: pr. Kythraea, V.1880, *Sintenis & Rigo 433^b* (G, K, P) - between Nisou and Staurousanni, 12.4.1933, *Syngrassides 27* (K).

18. Astragalus stella Gouan, Ill. observ. bot.: 50. 1773 ≡ *A. stellatus* Lam., Fl. Franc. 2: 641. 1778, nom. illeg. ≡ *Tragacantha stella* (Gouan)O.Kuntze, Revis. Gen.: 948. 1891. **Type:** *Tournefort* (non vidi).

= *A. stella* var. *acutifolius* DC., Astragal.: 105. 1802 ≡ *Tragacantha acutifolia* (DC.) O.Kuntze, Revis. Gen. 2: 940. 1891. **Holotype:** (P-JU!)

= *A. arenicola* Pomel in Bull. Soc. Sci. Phys. Algérie 11: 184. 1874. **Syntypes:** Arbaouat;

Brezina (G!); Maïa; Mehaïguen, all leg. *Pomel.* **Lectotype:** should be selected out of the cited material in the Montpellier Herbarium.

= *A. sesameus* var. *ambiguus* Rouy, Fl. France 5: 163. 1899 ≡ *A. ambiguus (Rouy)Sennen* in schedis impr. ad F.SENNEN, Plantes d'Espagne No. *4334.* 1922. **Syntypes:** Hautes Alpes, entre Aspremont et La Batie-Monsaléon, *Girod*; Saint-Siméon sur le Pech Auriol, *Biche*; env. de Béziers, *Liobérus* (not seen).

= *A. cruciatus* var. *polyactinus* Hochr. in Ann. Conserv. Jardin bot. Genève 7-8: 170. 1904. **Holotype:** Oran, Tiloula près d'Aïn Sefra, 1200 m, 18.5.1901, *Hochreutiner 308* (G!).

= *A. tribuloides* Del. var. *medians* Maire in Bull. Soc. Hist. Nat. Afr. Nord 27: 222. 1936. **Syntypes:** [Maroc] Anti-Atlas, Igherm, *Emberger & Maire*; Siroua, *Peltier*; Grand Atlas, Goundafa, *Reese.* **Lectotype** (here designated): Maroc, Massif du Siroua, IV.1935, *Peltier* (MPU!; Iso: P!).

= *A. cruciatus* var. *algeriensis* Sirj. in Repert. Spec. Nov. Regni Veget. 53: 228. 1944. **Syntypes:** *Balansa* Pl. d'Alg. 1853 sine nr.; et anno 1852 nr. *446*; *Pitard* Pl. de Tunisie *85.* **Lectotype** (here designated): *Balansa* Pl. d'Algérie 1853 s.n. (W!; Iso: G!, P!)).

= *A. cruciatus* var. *canariensis* Sirj. in Repert. Spec. Nov. Regni Veg. 53: 228. 1944. **Lectotype** (here designated): Ins. Fuerteventura, pr. Gran Tarajal, 11.6.1914 *Burchard 348* (W!; Iso: K!, M!)

- *A. polyactinus* Boiss., Fl. Or. 2: 226. 1872, nom. invalidum (not accepted by the author).

Figures: BONNIER, Fl. compl. ill. France, Suisse et Belqique vol. 3: pl. 144, fig. 781. 1914.

Plants branched at the base or unbranched, covered with 0,3-1,9 mm long, white hairs, at the nodes, stipules and in the inflorescence mostly also with black hairs. Stems 4-36 (- 50) cm long, procumbent to ascending, finely sulcate, covered with appressed to semipatent, sometimes also with patent hairs, at the nodes and stipules the hairs are mostly denser. Stipules green or greenish, (2,5-) 3-6 (-7) mm long, narrowly triangular, acuminate or sometimes long cuspidate, adnate at a length of 0,8-1,5 (-2) mm to the petiole, otherwise free, densely covered with white or mixed white and black hairs. Leaves 2-7,5 (-9) cm long; petiole 0,2-1 cm long, like the rachis covered with appressed to semipatent hairs. Leaflets (5-) 7-10 (-11) paired, 2,5-10 (-16) mm long and 1,5-3,5 (-5) mm broad, elliptic to narrowly oblong, rarely narrowly obovate, obtuse or slightly retuse, appressed hairy on both sides, mostly more densely on lower side. Inflorescences with a 2-11,5 cm long peduncle, hairy like the stem but more densely hairy and with more black hairs towards the inflorescence; flowers 4-11 (-15) in a rather dense head. Bracts membraneous, 1,5-3 (-3,5) mm long, lanceolate acuminate, with mixed white and black hairs. Flowers nearly sessile. Calyx 5-7 mm long, campanulate, covered with appressed to subappressed white and black hairs; teeth subulate, 1,5-3 (-3,8) mm long, shorter to nearly as long as the tube. Corolla yellow or violet. Standard (5,5-) 7-10 (-11) mm long and 2-4 mm wide, narrowly elliptic, emarginate at the apex, contracted into a narrow claw at the base. Wings (5-) 6-8 mm long, limb narrowly oblong, obliquely bilobed to nearly rounded at the apex, (2-) 3-4 mm long and 1-1,1 mm broad; auricle 0,8-1 mm long, claw (2,5-) 3-4 mm long. Keel (4-) 5-6 mm long, limb triangular-obovate, with lower edge broadly rounded and upper edge slightly rounded, acute at the apex, 1,5-2 mm long and 1-1,3 mm broad; auricle very short, claw (2-) 2,5-3 mm long. Staminal tube ± straightly cut. Ovary sessile or shortly stalked, hairy; style short, glabrous. Legumes star-like spreading or obliquely erect, sessile or with a stalk up to 1 mm long, erect, straight or slightly curved, lanceolate, rounded and very slightly enlarged at the base, 10-15 mm long, 2,5-3 mm high and 3-4 mm broad, carinate on ventral side, deeply and narrowly grooved on dorsal side, ending into a short and nearly straight or up to 1-2 mm long and curved or nearly hooked beak; valves leathery, nearly flat, covered with

two kinds of hairs (double indumentum): densely with short appressed 0,05-0,2 mm long hairs and more loosely with much longer semipatent to patent up to 1,9 mm long hairs, sometimes with curved apex. Legumes opening only along the ventral suture, the septum 1-1,2 mm broad, but fully bilocular because of the deeply intruded dorsal groove. Seeds 4-7 in each locule, 2-3 mm long and 1,5-2 mm broad, brown and sometimes with black notches, smooth.
Flowering time: I-VI. **Occurence:** on all kinds of soil under mediterranean and semidesert conditions, mainly in the plains but up to 2050 m in Central Sahara.
Distribution: France, Portugal, Spain, Canary Islands, Morocco, Algeria, Tunisia, Libya, Egypt. Map 18.

Remarks:

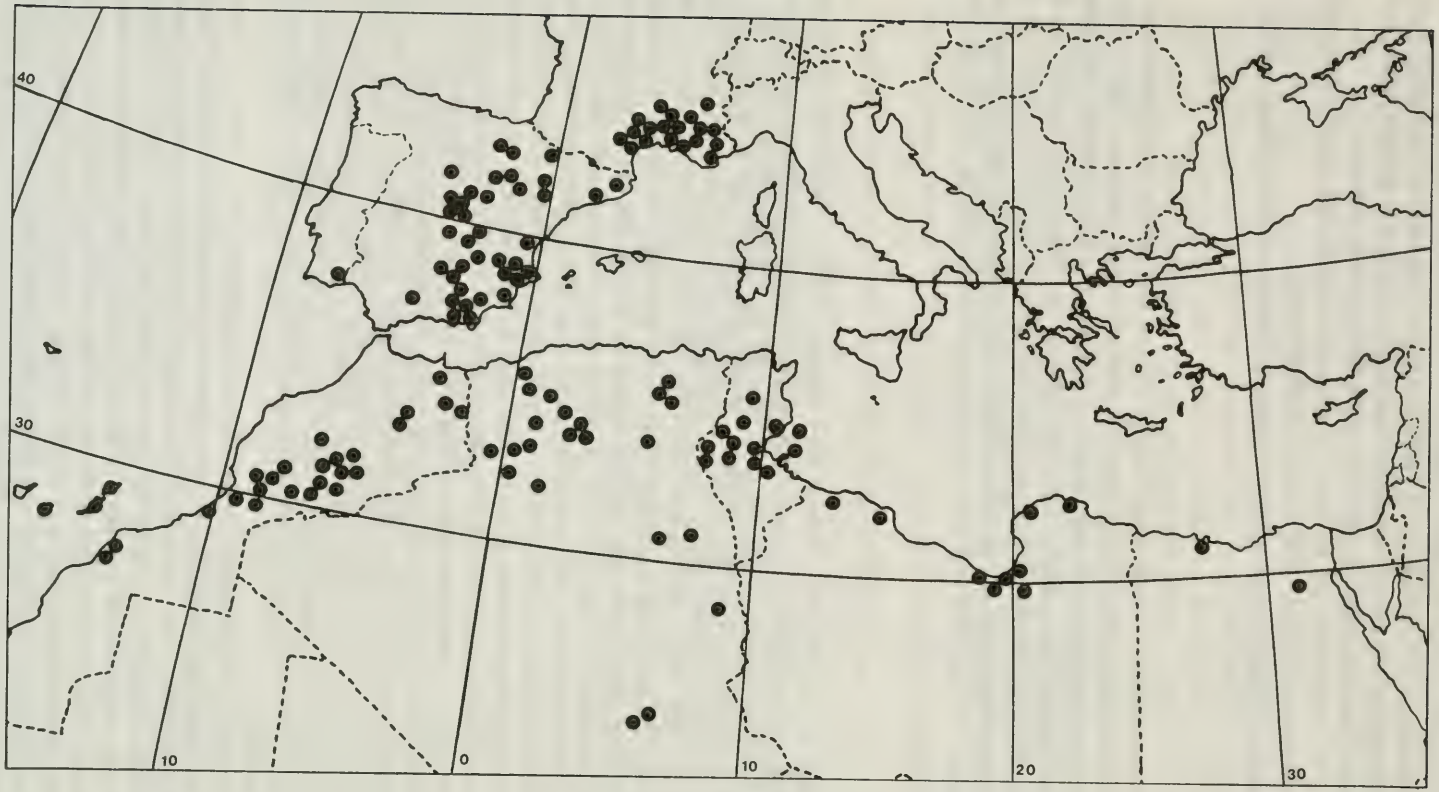
This species is rather variable in form, length and number of fruits within one inflorescence. In North Africa we can find often populations with relatively small legumes. These plants correspond with *A. arenicola* Pomel. As there are all intermediates to the plants with big pods, this species can not be uphold as a taxon of its own. Also the number of legumes within one head is not a good character. We can find plants with a high number (up to 10 or more) in all parts of the area. As treated in the introductory chapters all species of the sect. *Sesamei* are autogamous. Therefore we can find very often stable populations in respect of these variable characters.

Specimens seen:

France. Dep. Aude: Moux, 30.5.1898, *Delpont* (G) - Mailhac, V.1843, *Naudin* (G) - Moussan, 28.5.1903, *Sennen*(G). -- Dep. Hérault: sur la route impériale de Béziers à Carcassonne près de Nissan, V.1856, *Blanc* in Fl. Gall. et Germ. ed. BILLOT *2047* (BM, G, P) - Béziers, 1854, *Grenier* (W) - Montady près Béziers, 2.6.1873, *Aubouy* (B) - Béziers, V.1876, *Genevier* (G) - dto., V.1890, *Huguenin 181* (W) - Agde, 21.5.1865, *Thevenau* (K) - Grabels à Valmangues, 15.5.1879, *Chenevière* (G) - Montpellier, *Delile* (G, W) - dto., 1837, *Grenier* (G) - dto., 2.6.1842, *Joad* (K) - dto., 3.6.1898, *Mandon* (G, W) - dto., Umgebung von Montellier, 14.6. 1957, *Patzke* (Hb. PODL.) - extinct volcano near Montpellier, 1.6.1856, *Wolfe* (K). -- Dep. Ardèche: Vogué, VI. 1891, *Girod* (G). -- Dep. Gard: Les Angles, 10.6.1876, *Delacour* (K) - dto., 1.6.1881, *Delacour* (G) - à Beaucaire, V.1886, *Neyra* in SCHULTZ, Herb. norm. *2323* (B, G, K, W). -- Dep. Vaucluse: Avignon, 3.6.1871, *Willmott* (K) - dto., 1876, *Thélephore* (W) - Le Pintet, IV.1863, *Mill* (K). -- Dep. Hautes-Alpes: Gap, 5.6.1900, *Girod* (G) - dto., 900 m, 12.6.1902, *Brachet* (G) - dto., à St. Jean, 900 m, 12.6.1902, *Faure* (G) - dto., 1903, *Girod* (B, MA) - Gap, à La Celle, VI.1903, *Girod* (B. M) - dto., 10.4.1904, *Girod* (MA) - entre St. Jean et La Celle, V.1900, *Girod* in Soc. l'étude flore Franco-Helvet. *1179* (G) - Mgne. de Crigne près Vitrolles, Gap, 23.6.1872, *Borel* (K) - dto., 1883, *Burle* (B, K, W). -- Dep. Basses-Alpes: prope Noizelles, 400 m, 15.5.1969, *Charpin & Greuter 8348* (G). -- Dep. Bouches-du-Rhône: Miramas, 30.5.1876, *Autheman* (G) - Roquefavour, 17.6.1860, *Roux* (G) - Prégnon près Aix en Provence, VI.1890, *Bruyas* (BM) - Martigues, 26.5.1861, ? (K) - St. Victoret, 23.5.1882, *Autheman* (B) - Pas-de-Lanciers, 20.6.1872, *Schmidely* (G) - dto., 3.6.1876, *Autheman* in Soc. dauph. *1591* (G, K, P, W) - Marseille, *Huguenin* (B). -- Dep. Var: Toulon, ? (B) - Draguignan, 1839, *Perreymond* (G, K) - dto., V.1910, *Girod* (G) - La Motte, V.1911, *Girod* (G).

Portugal. Algarve. Faro: pr. Castro Marim, 1848, *Welwitsch 380* (BM, G).

Spain. León. Prov. Salamanca: Cabrerizos, 7.6.1979, *Rico* (MA). -- **Castilla La Vieja**. Prov. Burgos: Bujedo, VIII.1910, *Elias* (G) - dto., 14.7.1921, *Elias* in Sennen *4334* (MA). -- Prov. Valladolid: Fombedilla, 7.6.1977, *Diez* (MA) - Encinas de Esgueva, 15.5.1983, *Alonso* (MA) - Valladolid, 10.5.1865, *Reuter* (G) - dto., 20.6.1906, *Sennen 57* (MA, W). -- Prov. Soría: Pantane de Monteagudo, 800 m, 28.5.1960, *Segura Zubizarreta* (MA) - Ambrona, 1100 m, 4.6.1977, *Segura Zubizarreta* (G). -- **Vascongadas.** Prov. Alava: Ribazas, 520 m, 30.5.1985, *Alejandre* (MA). -- Prov. Navarra: Ribazo, 340 m, 28.5.1985, *Alejandre 1611.85* (MA). -- **Aragón.** Prov. Huesca: Aguinalin, Barranco de Agua Salada, 520 m, 2.6.1885, *Montserrat* (JACA) - Castiello de Jaca, 920 m, 29.6.1971, *Montserrat* (B, G, MA). -- Prov. Zaragoza: Calatayud, 1907-1910, *Vicioso* (B, G, MA, W) - Bujaraloz, 350 m, 18.5.1972,



Map 18. Distribution of *Astragalus stella*

Charpin (G). -- Prov. Teruel: Camarena, 1500 m, VI.1892, *Reverchon 30* (G). -- **Cataluna.** Prov. Girona: Penedès, 12.5.1951, *Palau* (MA). -- Prov. Lerida: 2 km E Alfarras an der Straße (148) nach Balaguer, 330 m, 2.6.1988, *Podlech 44290* (Hb. PODL.) - Balaguer, 250 m, 23.5.1926, *Font Quer* (MA). -- Prov. Barcelona: Barcelona, V.1873-1879, *Tremols* (G, W) - dto., V.1873, *Jover* (MA) - dto. Tibidabo, VI.1910, *Sennen 974* (MA, W) & *975* (BM) - dto., 26.5.1915, *Sennen* in Soc. Franc., exs. DUFFOUR *1664* (BM, G, MA) - dto., 29.4.1920, *Sennen* (K). -- **Castilla La Nueva.** Prov. Guadalajara: Jadraque, 4.6.1970, *Bellot & al.* (MA). -- Prov. Madrid: El Pardo, VI.1930, *Merido* (MA) - Madrid, 1834, *Boissier* (G) - dto., 1839, *Rodriguez* (G) - dto., IV.1841, *Reuter* (G) - Madrid, Cerro Negro, 24.5.1824, *Rodriguez* (MA) - dto., V.1841, *Reuter* (BM, G) - dto., VI.1843, *Amo* (MA) - V.1916, *Vicioso* (B, MA) - 21.5.1924, *Font Quer* (MA) - Madrid, Ciudad Universitaria, 30.4.1953, *Carreira* (MA) - Vallecas, 25.4.1877, *Joad* (K) - dto., 21.4.1918, *Vicioso* (MA) - San Fernando de Henares, V.1920, *Cogolludo* (MA) - Loeches, 2.5.1928, *Wilmott* (BM) - dto., 30.4.1966, *Bellot & Monasterio* (MA) - Alcala de Henares, 23.4.1853, *Isern* (MA) - dto., 30.5.1854, *Bourgeau 2126* (G, K) - Cerro de Angeles, 31.5.1925, *Lacaita* (BM) - Getafe, V.1914, *Vicio-so* (MA) - Ciempozueolos, 18.5.1897, *Pau* (MA) - Aranjuez, *Colmeiro* (MA) - dto., 8.5.1924, *Gros 200* (MA) - dto., 11. 5.1924, *Font Quer 278* (MA) - Villaconejos, 13.6.1975, *Segura Zubizarreta* (MA). -- Prov. Toledo: Algodor, V. 1925, *Caballero* (MA). -- Prov. Cuenca: Hito, 19.6.1975, *Santos Cirnjano* (MA). -- Prov. Ciudad-Réal: Ciudad-Réal, VI.1879, *Laguna* (K) - El Lobillo, 25.6.1939, *Albo* (MA). -- **Valencia.** Prov. Castellón: La Lorna, Segorbe, 18.5. 1885, *Pau* (MA) - Sierra Segorbe à Montemalo, 500 m, VI. 1891, *Reverchon 698* (BM, G, K, W) - Segorbe, 28.5.1918, *Pau* (MA). -- Prov. Alicante: Cabeso de Las Seduras, Villena, *Rigual* (MA) - Sierra Mariola, *Vilanova* (MA) - Monte Agudo near Novelda, 3.5.1959, *Rigual* (MA) - Puerto de La Carrasqueta, Jijona, 31.4.1962, *Rigual* (MA) - Peña de Jijona, 7.7.1959, *Rigual* (MA) - Sierra de Monalba, Agost, *Rigual* (MA) - Busot, 1.5.1963, *Rigual* (MA). -- **Murcia.** Prov. Albacete: prope La Grajuela, IV.1854, *Guirao* (G) - Alcaraz, 1936, *Albo* (MA) - dto., 19.6.1984, *Herranz* (MA) - dto., 700 m, 1975, *Poltaschek* (BM, G, W) - Tobarra, *Cavanilles* (MA). -- Prov. Murcia: Fortuna, VI.1933, *Ripley 124* (K) - S. Feroni de la Murta, 15.5.1957, *Vidal* (JACA) - Cartagena, 6.4.1851, *Bourgeau 1141* (G, K). -- **Andalucia.** Prov. Jaen: Larva, 500 m, 15.6.1971, *Fernándes-Casas* (MA) - entre Hinojares y Ceal, 16.6.1971, *Fernándes-Casas* (MA). -- Prov. Cadiz: Puerto de Santa María, 2.5.1973, *Hurtado* (MA). -- **Granada.** Prov. Malaga: Bobadilla, 8.4.1908, *Nicholson* (BM). --Prov. Granada: Alicún de Ortega, 11.6.1971, *Fernándes-Casas* (MA) - entre Gorafe y Baños de Alicún, 800 m, 10.6.1971, *Fernándes-Casas* (M, MA) - above Guadix high road, 9.5.1926, *Ellmann & Sandwith 571* (K) - Rambla à Guadix, 16.5.1929, *Gros* (MA) - 5 km E Ugijar on C 331 Alpujarra Alta, 12.4.1973, *Leadlay & al.* (BM). -- Prov. Almeria: Fiñana, 4.5.1951, *Simpson 51.511* (BM) - Tabernas - Rioja, 400 m, 30.5.1971, *Fernándes-Casas* (MA) - Antas, 15.3.1970, *Fernándes-Casas* (MA) - Cerro de San Christobal (in Almería), 130 m, 1.3. 1955, *Montserrat* (JACA).

Canary Islands. Gran Canaria: Baio del Confital, II. 1905, *Pitard 144* (G). -- Fuerteventura: Casillas del Angel, 22.3.1976, *Kunkel 18906* (G) - Tesjuates, 1.4.1976, *Kunkel 19070* (G) - Puerto de Lajas, II.1905, *Pitard* (P) - near Airport, 30.3.1976, *Kunkel 18968* (G) - Pozo Negro, 27.3.1981, *Lobin* (Hb. PODL.) - prope Gran Tarajal, 11.6. 1914, *Burchard 348* (K, M, W) - prope portum Cabras, 19.2. 1846, *Bourgeau 794* (BM, G, K, P) - dto., 22.2.1905, *Pitard* (P) -- dto., 5.4.1936, *Brooke 338* (BM) - Oto Cobras, II. 1905, *Pitard 1366* (P) - Puerto de Lajas, II. 1905, *Pitard 141* (P). -- Lanzerote: Costa Rubicon bei Yaiza, II.1897, *Andreas* (M) - near Tías, 100 m, 25.4.1972, *Kunkel 14928* (G) - Arrecife, *Lowe* (BM, K) - Tnubio, 10 m, 24.3.1978, *Cullett 21673* (K).

Morocco. Prov. Nador: 5 km N Selouane, 4.5.1979, *Pasquier 134* (G) - Moulouya (Kebdana), 14.6.1932, *Sennen & Mauricio* (BM). -- Prov. Fès: Hte. Moulaya, route Midelt - Missour, IV.1939, *L'Hermite* (P) - 15 km WSW Missour an der Straße nach Ksabi (S 329), 1000 m, 14.4.1987, *Podlech 42386* (G, Hb. PODL.). -- Prov. Taza: 18 km NE Missour an der Straße nach Guercif (S 329), 14.4.1987, *Rechtsteiner* (G, LE, LG, MA, RSA, TARI, Hb. PODL.) - 21 km NE Missour an der Straße nach Guercif (S 329), 14.4.1987, *Podlech 42335* (Hb. PODL.). -- Prov. Marrakech: Asni, 23.4.1936, *Simpson 36.397* (BM). -- Prov. Agadir: 20 km WSW of Taroudant, Sous Valley, 2.5.1961, *?* (BM) - High Atlas, 19 km S of Tizi-n-Test, 2000 m, 5.4.1974, *Miller & al. 753* (MB) - S'Seite des Tizi-n-Test, 1000 m, 14.4.1967, *Merxmüller & Oberwinkler 22439* (M) - zwischen Aoulouz und Tazenakht, 1700 m, 14.4.1967, *Merxmüller & Oberwinkler 22493* (M) - Montagne de Siggrat et Ghiliz jusque vers Ighirmillul à l'Est du distr. de Tazeroualt, 1876, *Mardochée* (P) - Djebel Tizelmi et montagnes du

Tazeroualt, 1876, *Mardochée* (G, P) - Anti-Atlas, 4 km SW Souk-el-Had-de-Tahala an der Straße von Tafraoute nach Tiznit, 22.4. 1987, *Podlech 42934* (Hb. PODL) - Foumakili, district d'Ida Ouchemlal, 1876, *Mardochée* (P) - Anti-Atlas, 4 km NE Souk-Tnine-de-Tarsoute, *Podlech 45608* (Hb. PODL.) - Anti-Atlas, S side of Tizi-Mighert pass, above Bou-Iza-karne, 800-900 m, 24.3.1969, *Davis 48670* (BM) - 5 km E Bou-Izakarne an der Straße nach Akka (P 30), 600 m, 13.4. 1986, *Podlech 40687* (G, Hb. PODL.) - dto., *Podlech 40695* (G, MA, TARI, Hb. PODL.) - Anti-Atlas, 5 km W Igherm an der Piste nach Tafraoute (7038), 1720 m, 28.4.1989, *Pod-lech 45456* (Hb. PODL.)- Anti-Atlas, Iramidene, 33 km SE Taroudant an der Straße nach Irherm (7027), 570 m, 16.4. 1986, *Podlech 40859* (Hb. PODL.) - Djebel Tizelmi et montagnes du Tazeroualt, 1876, *Mardochée* (K) - 3 km N Souk Khemissé an der Straße von Tata nach Irherm, 1110 m, 28. 4.1989, *Podlech 45384* (Hb. PODL.). -- Prov. Layoune: Umgebung von Daouerah, ca. 50 km NNE Layoune an der Straße nach Tarfaya, 30 m, 11.4.1986, *Podlech 40512* (Hb. PODL.) - 2 km N Layoune, 11.4.1986, *Podlech 40496* (Hb. PODL.). -- Prov. Ouarzazate: Anti-Atlas, 2 km E Taliouine, 1130 m, 16.4.1986, *Podlech 40944, 40962* (Hb. PODL) -- Massif du Siroua, IV.1935, *Peltier* (P) - Ouarzazate, 26.3.1980, *Lewalle 9283* (BM) - Paßhöhe Tizi-n-Tinfift, ca. 20 km W Agdz an der Straße nach Ouarzazate, 1650 m, 11.4.1990, *Podlech 49517* (Hb. PODL.) - prope Msemrir, 2010 m, 1.6. 1985, *Blanche & al. 10* (MA) - Imiter, 21 km E Boulmane du Dadès an der Straße nach Tinerhir, 1380 m, 17.4.1987, *Rechtsteiner* (Hb. PODL.) - dto., *Podlech 42658a* (G, Hb. PODL.) - 12 km E Tinerhir an der Straße nach Goulmina (P 32), 1250 m, 17.4.1987, *Podlech 42618* (Hb. PODL.) - dto., *Lippert 22173a* (M) - 22 km W Tinejdad an der Straße von Goulmina nach Tinerhir (P 32), 1100 m, 16.4.1987, *Podlech 42605* (Hb. PODL.). -- Prov. Er-Rachidia: 12 km E Tinejdad an der Straße nach Erfoud (3451), 980 m, 16.4.1987, *Rechtsteiner* (Hb. PODL.)

Algeria. Wil. Oran: Oran, *Munby* (G) - Bedeau, 1100 m, 25.5.1921, *d'Alleizette* (MA). -- Wil. Saïda: près de Timetlas, 25.5.1852, *Balansa 446* (G, K, P, W) - Ben Zireg, 14.5.1906, *Romieux 632* (G) - Ain Sefra, *Battandier* (G). -- Wil. Bechar: 33 km E Aïn Sefra an der Straße nach El Bayadh, 1150 m, 5.4. 1980, *Podlech 33921* (G, M, Hb. PODL.) - 21 km ENE Chellalah Dahrania (100 km ENE Ain Sefra) an der Straße nach El Bayadh, 1240 m, 5.4. 1980, *Podlech 33967* (G, HUJ, M, Hb. PODL.). -- Wil. Djelfa: 38 km NW Laghouat an der Straße nach Aflou, 930 m, 6.4.1980, *Podlech 34049* (M, Hb. PODL.). -- Wil. Laghouat: between Laghouat and Tagmut, 930 m, 9.4.1937, *Alston & Simpson 37.077* (BM) - Sidi-Makhlouf près Laghouat, V. 1854, *Reboud* (P) - Dahia de Guerrara-el-Hamra, Laghouat, 3.5. 1854, *Reboud 130* (P). -- Wil. Batna: Aurès Gebirge, N Tighanimine, Flußbett des Oued Abiod, 14.4.1982, *Podlech 37245* (Hb. PODL.) - El Abiod to Sidi Cheikh, 4.5.1899, *Chevallier 291 p.p.* (G) - Banian, Oued Abiod, IV. 1936, *Gougerot-Nicot* (P) - dto., 15.4.1937, *Simpson 37.253* (BM). -- Wil. Biskra: Biskra, IV.18888, *Girod* (G) - dto., 1938, *Trethewy 130, 133* (K) - Mnechounès près Biskra, 18.5.1853, *Balansa* (P). -- Wil. Ouargla: Plateau du Tinrhert, 70 km N In Amenas an der Straße nach Hassi Bel Guebbour, 670 m, 12.3.1980, *Podlech 32941* (G, HUJ, M, Hb. PODL.). -- Wil. Tamanrasset: Hoggar Massiv, Guelta Afilale, nahe der Straße von Tamanrasset zum Assekrem, 2000-2050 m, 24.3.1980, *Podlech 33339* (CAI, G, HUJ, LG, Hb. PODL.) - dto., 20.3.1981, *Podlech 34909* (G, M, Hb. PODL.) - Hoggar Massif, Guelta Issakarassene an der Piste von Hirafok zum Assekrem, 1930 m, 20.3.1981, *Podlech 35001* (M, Hb. PODL.).

Tunisia. Prov. Sfax: Sfax, 1856, *Ducouret* (P) - dto., 5..4.1884, *Doumet-Adanson & Bonnet* (P) - route de Sfax à Gabès, 7.4.1909, *Hibon* (P). -- Prov. Kairouan: Haffouz, 19.1.1971, *Röthlisberger* (G). -- Prov. Kasserine: Feriana, 25.5.1884, *Robert* (P). -- Prov. Tozeur: Hazoua, Grenzstation nach Algerien, 40 m, 10.3.1980, *Podlech 32852* (G, Hb. PODL.) - Tozeur, IV.1908, *Pitard 361* (G). -- Prov. Gafsa: 18 km NNE Bir El Afey (88 km NNE Gafsa) an der Straße nach Kairouan, 410 m, 10.4.1980, *Podlech 34271* (Hb. PODL.) - 10 km NNE Metlaoui, 17.4.1968, *Wagenitz 1350* (B) - Gafsa, *Robert* (P) - dto., IV.1909, *Pitard 1804* (B, BM, G, W) - dto., IV.1910, *Pitard 1393, 1805* (G) - dto., 4.4.1938, *Simpson 38.132* (BM) - El Guettar, IV.1909, *Romieux 631* (G) - dto., V.1909, *Pitard 2788* (G). -- Prov. Gabès: El Hamma de Gabès, 1913, *Pitard 2826, 2827* (G) - Gabès, 13.3.1854, *Kralik 168* (P) - dto., II. 1913, *Pitard 2828* (G) - dto., 30.3.1938, *Simpson 38.051* (BM) - Gabès, Metrech, III.1907, *Pitard 85* (G, P) - Sidi-Boul-Baba prope Gabès, 3.4.1854, *Kralik* (G, P) - 9 km S Gabès, 3.3.1968, *Leippert 7021* (B) - Kebira (Matmata), III.1910. *Pitard 2287* (G). -- Prov. Medenine: Ile de Djerba, coté SE de l'île, 10.3.1968, *Gauthier 11755* (G) - 6 km W Médinine, 18.3.1971, *Röthlisberger* (G) - Medinine, II.1907, *Pitard 85bis* (K) - Bir el Ahmar (S Medinine), 4.4.1884, *Letiurneux* (P).

Libya. Tripolitania: near Pisida, towards Zuwarah, 25.3.1939, *Sandwith 2848* (K) - Azizia plain,

23.1.1949, *Johnson 110* (BM) - near Al Kararim, 8.3.1968, *Boulos 1901* (G) - 56 km S Jaurga, 22.4.1939, *Simpson 39.665* (BM). -- Cyrenaica: 36 km S of Agheila to Marada, 5.3.1958, *Gui-chard 54/58* (BM) - 26 km E Mersa Brega, SW Agedabia, 17. 4.1939, *Sandwith 2672* (BM, K) - 13 miles S Agedabia on Gâlo track, 30.3.1939, *Simpson 39.116* (BM) - between Agedabia and the wadi Zareghi, 30.3.1939, *Sandwith 2157* (K) - above Barce, ca. 500 m, 14.4.1939, *Sandwith 2645* (K) - Tarzaniet, 10 km SE Bescer, 9.3.1958, *Guichard 80/58* (BM) - Derna, 6.4.1887, *Taubert 183* (P) .

Egypt: Wadi Hof, III.1978, *Merxmüller* (M).

19. Astragalus tadmorensis Eig & Samuelsson in Eig, Syst. Studies Astrag. Near East: 11. 1955. **Syntypes:** [Syria] Palmyra ad ruinas, 9.4.1890, *Post*; dto., 16.4.1933, *Samuelsson*; dto., 3.1.1934, *Mouterde*. **Lectotype** (here designated): Syria, Palmyra, 16.4.1933, *G. Samuelsson 3414* (HUJ!; Iso: W!)).

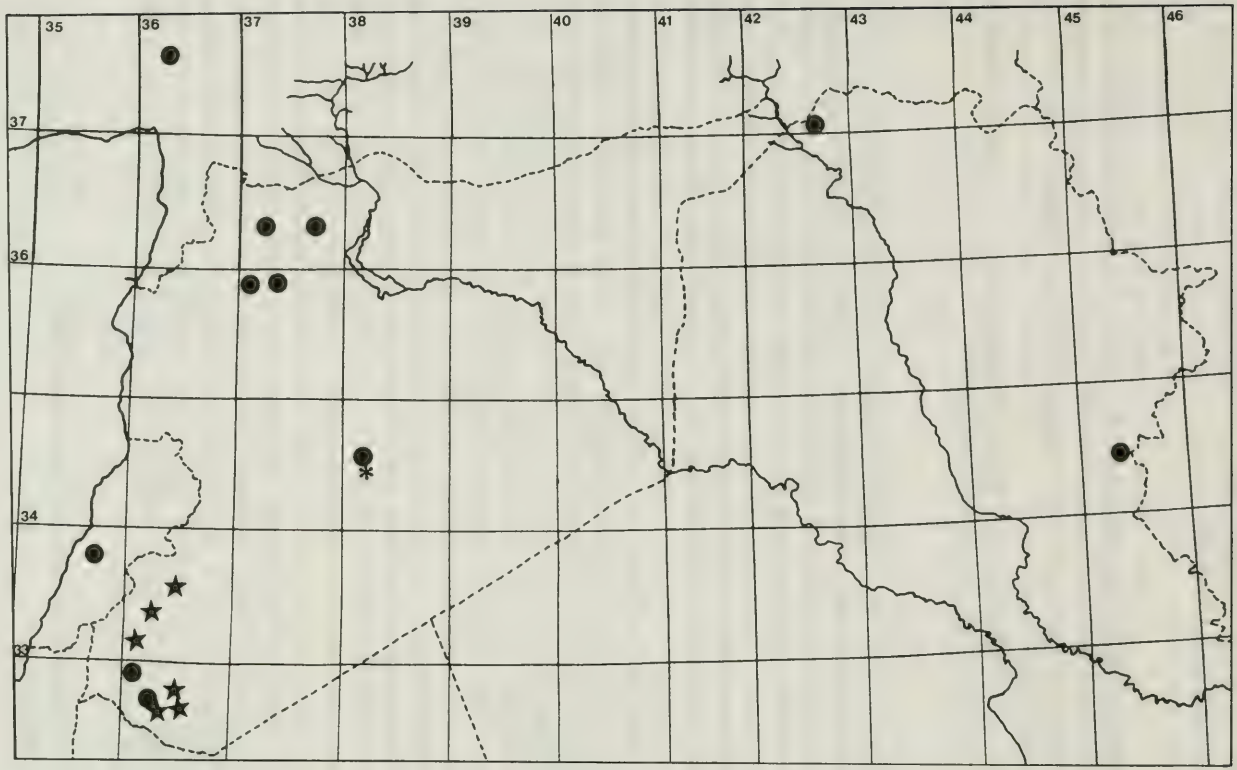
= *A. cruciatus* Link var. *brachylobus* Post, Plantae Postianae Fasc. 1: 6. 1890. **Holotype:** Ruins of Palmyra, 9.4.1890, *Post 101* (G!; Iso: HUJ!).

Plants annual, branched at the base, covered in vegetative parts with adpressed 0,3-0,9 mm long white hairs, at the stipules and in the inflorescence also with black hairs. Stems nearly absent or up to 15 cm long, prostrate or ascending, finely sulcate, covered loosely to densely with hairs up to 0,8 mm long. Stipules green, 2-2,5 mm long, narrowly triangular, acute, at the length of ca. 0,5 mm adnate to the petiole, otherwise free, ciliate at the margin or hairy. Leaves 2-3,5 cm long, nearly sessile, the rachis loosely to densely covered with appressed hairs up to 0,7 mm long. Leaflets 5-8 paired, 2-4,5 mm long and 1-1,5 mm wide, elliptical or narrowly elliptical, rounded at the apex, both sides rather densely adpressed hairy. Inflorescences with a slender, densely adpressed hairy peduncle 1-3 cm long, with 3-4 flowers crowded into a head. Bracts hyaline, ca. 0,7 mm long, narrowly triangular, acute, white and black ciliate at the margin. Flowers nearly sessile. Calyx 3-4 mm long, campanulate, sparsely covered with white and black appressed hairs 0,3-0,5 mm long; the teeth 0,7-0,9 mm long, subulate, acute. Standard 8-10 mm long and 3-3,5 mm wide, the limb narrowly obovate, retuse at the apex, shortly narrowed into a claw. Wings 6-7 mm long, the limb narrowly oblong, retuse at the apex, 2,8-3 mm long and ca. 1 mm wide; auricle 0,8-1 mm long, the claw 2,8-3 mm long. Keel ca. 4 mm long, limb obliquely obovate, the lower edge broadly rounded, the upper edge slightly rounded, obtuse at the apex, ca. 2 mm long and 1,2 mm wide. Staminal tube straightly cut. Ovary sessile, hairy. Legumes sessile, linear-oblong to narrowly elliptical, straight oder slightly bent toward the ventral side, broadly rounded to slightly bigibbous at the base, acute at the apex, 9-12 mm long, 3,5-4 mm high and 3-3,5 mm wide, carinate ventrally, deeply grooved dorsally, the groove distinctly widened toward the base; valves densely covered with two kind of hairs (double indumentum): short, adpressed, 0,1-0,2 mm long hairs and much longer subappressed to semipatent hairs up to 1,4 mm long, inserted in brownish coloured distinct tubercles. Pods opening along the ventral suture, with septum ca. 1 mm broad but fully bilocular because of the deeply intruding dorsal groove. Seeds 4-5 in each locule, ca. 2 mm long and 1,5 mm broad, brown, smooth.

Flowering time: IV. **Occurence:** in semidesert and steppe plains.
Distribution: Syria. Map 19.

Specimens seen:

Syria: Palmyra, 9.4.1890, *Post* (G, HUJ) - dto., 16.4.1933, *Samuelsson 3414* (HUJ) - dto., 3.4.1934, *Gombault 4050* (P, Hb. PODL.) - dto., 16.4.1965, *Doppelbaur 133* (M)



Map 19. Distribution of ✱ *Astragalus tadmorensis,*
★ *Astragalus transjordanicus,* ● *Astragalus triradiatus*

20. Astragalus transjordanicus Samuelsson in Ark. Bot. ser. 2, 1 (5): 307. 1950. **Type:** Transjordania, prope Es Sahab (ad orientem), ca. 750 m, 6.5.1932, *Samuelsson 887* (not seen)

Figures: ZOHARY, Fl. Palaestina 2, part 2: pl. 75. 1972.

Plants annual, branched from the base, covered with subadpressed to semipatent 0,2-1,1 mm long white, in the inflorescence also with black hairs. Stems prostrate, covered with semipatent up to 0,7 mm long hairs. Stipules membraneous, 1-2,5 mm long, narrowly triangular, acuminate, very shortly adnate to the petiole, otherwise free, ciliate at the margin. Leaves 2-6,5 cm long, subsessile; rachis with semipatent 0,4-1 mm long hairs. Leaflets 5-9 paired, 1,4-4 mm long and 0,8-1,5 mm broad, narrowly elliptic, rounded or truncate at the base and obtuse at the apex, both sides densely subappressed hairy. Inflorescences with a 1-2,5 cm long, subappressed hairy peduncle, with 2-4 flowers in a head. Bracts membraneous, 1-1,5 mm long, narrow, acute, white and black ciliate. Calyx 5-6 mm long, tubular, covered with black and white adpressed hairs, at the teeth only with black hairs; teeth subulate, 2-3 mm long, nearly as long as the tube. Corolla violet. Standard 9-12 mm long and 3-4 mm broad, narrowly oblong-rhombic, emarginate at the apex. Wings ca. 8 mm long, the limb narrowly oblong, rounded at the apex, ca. 4 mm long; auricle ca. 1 mm long, claw 3-4 mm long. Keel ca. 6 mm long, the limb triangular-obovate, ca. 3 mm long; auricle very short, claw ca. 3 mm long. Staminal tube ending with a curved line. Legumes sessile, linear-lanceolate, 15-25 mm long, 3,5-4,5 mm high and 5-6 mm broad, rounded at the base, ending in a 0,5-1 mm long recurved beak, carinate on the ventral side, deeply grooved on the dorsal side, with somewhat rugose surface, covered with tuberculate, patent hairs 1,5-2,3 mm long, hairs affixed laterally onto the tubercules with an oblong subbasal cicatrice.. Pods opening along the ventral suture, fully bilocular.. Seeds 6-7 in each locule, kidney-shaped, 3-3,5 mm long and 2-2,5 mm broad, brown, smooth.
Flowering time: III-IV. **Occurence:** in semidesert and steppe places.
Distribution: Syria (endemic). Map 19.

Specimens seen:

Syria. Umgebung von Damascus, S Seid Naya, 18.4.1965, *Doppelbaur 251* (M) - Hauran, Sunamen, 26.4.1895, *Peyron 63162* (P) - Haouaran, inter Gabagueb et Sanamein, 660 m, 7.5.1933, *Samuelsson 4465* (HUJ, W) - Djebel Druze, Soueida, 28.4.1942, *Gombault 5936* (P) - Bosra, 7.5.1886, *Post* (B) - entre Bosra et Salkhad, 3.5.1934, *Gombault 4051* (P).

21. Astragalus tribuloides Del. in Descr. Egypte, Hist. Nat.: 70. 1813 ≡ *Oxyglottis tribuloides* (Del.)Nevski in Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyss. Rast. 4: 259. 1937). **Lectotype** (here desigatned): Egypte, *Delile* (MPU!; Iso: P!).

= *A. perpusillus* Bertol., Misc. Bot. 2: 16. 1843. **Type:** Ex oris Euphratis, *Chesney* no. *166* (BM!, G!, K!).

= *A. ammocryptus* Boiss., Diagn. pl. or. 9: 59. 1849 ≡ *A. tribuloides* Del. var. *leiocarpus* Boiss., Fl. Or. 2: 225. 1872. **Type:** in deserto Arabiae petreae ad fines Palestinae, IV. 1846, *Boissier* (G!).

= *A. erpocaulos* Boiss., Diagn. pl. or. 9: 58. 1849. **Holotype:** in deserto Arabiae petreae, inter Nuckl et Gaza, *Boissier* (G-BOIS!).

= *A. minutus* Boiss., Diagn. pl. or. 9: 58. 1849 ≡ *A. tribuloides* Del. var. *minutus* (Boiss.)

Boiss., Fl. Or. 2: 225. 1872. **Syntypes:** in Persia prope Ispahan, *Aucher 4419*; prope Persepolim, *Kotschy 837*; prope Teheran, *Kotschy 41*. **Lectotype** (here designed): prope Teheran, *Kotschy 41* (G-BOIS; Iso: BM!, K!, M!, W!)

= *A. tribuloides* Del. var. *thapsacenus* Hand.-Mazz. in Ann. Naturh. Mus. Wien 27: 27. 1913. **Lectotype** (here designated): Steppe bei Abu Herera unterhalb Meskene am Euphrat, 26.3. 1910, *Handel-Mazzetti 418* (W!; Iso: B!)

= *A. tribuloides* Del. var. *albolanatus* Nábelek in Publ. Fac. Sc. Univ. Masaryk 35: 75. 1923. **Type:** [Jordan] ad oppidum Ma'ân, 1100 m, 21.6.1909, *Nábelek 3054* (Foto: K!)

= *A. tribuloides* Del. var. *glaberrimus* Popov in Bjull. Sredne-Aziatsk. Gosud. Univ. 14: 130. 1926. **Holotypus:** Krasnovodsk, *Michelson* (not seen)

= *A. tribuloides* Del. var. *elarishensis* (*"el-arishen- sis"*) Eig in Bull. Inst. Agr. Nat. Hist. 6: 29. 1927. **Holotypus:** [Sinai] Wady El-Arish, 1.5.1925, *Eig* (HUJ!).

= *A. tribuloides* Del. var. *paucijugus* Bornm. in Beih. Bot. Centralbl. 57: 263. 1937. **Syntypes:** Persien, Prov. Kerman, Hügel bei Kerman, 2000 m, 24.4.1892, *Bornmüller 3739, 3740*. **Lectotype** (here designated): Prov. Kerman, Hügel bei Kerman, 2000 m, 24.4.1892, *Bornmüller 3739* (B!; Iso: K!, W!).

= *A. tribuloides* Del. var. *mareoticus* Sirj. in Feddes Repert. Spec. Nov. Regni Veg. 53: 227. 1944. **Lectotype** (here designated): ad lacum Mareotidem, *Letourneux 48* (W!; Iso: B!, K!, P!)

= *A. kirghizicus* Schtschegleev in Bull. Soc. Imp. Naturalistes Moscou 27: 161. 1854 ≡ *A. tribuloides* Del. var. *kirghizicus* (Schtschegleev)Sirj. in Repert. Spec. Nov. Regni Veg. 53: 226. 1944. **Type:** ??

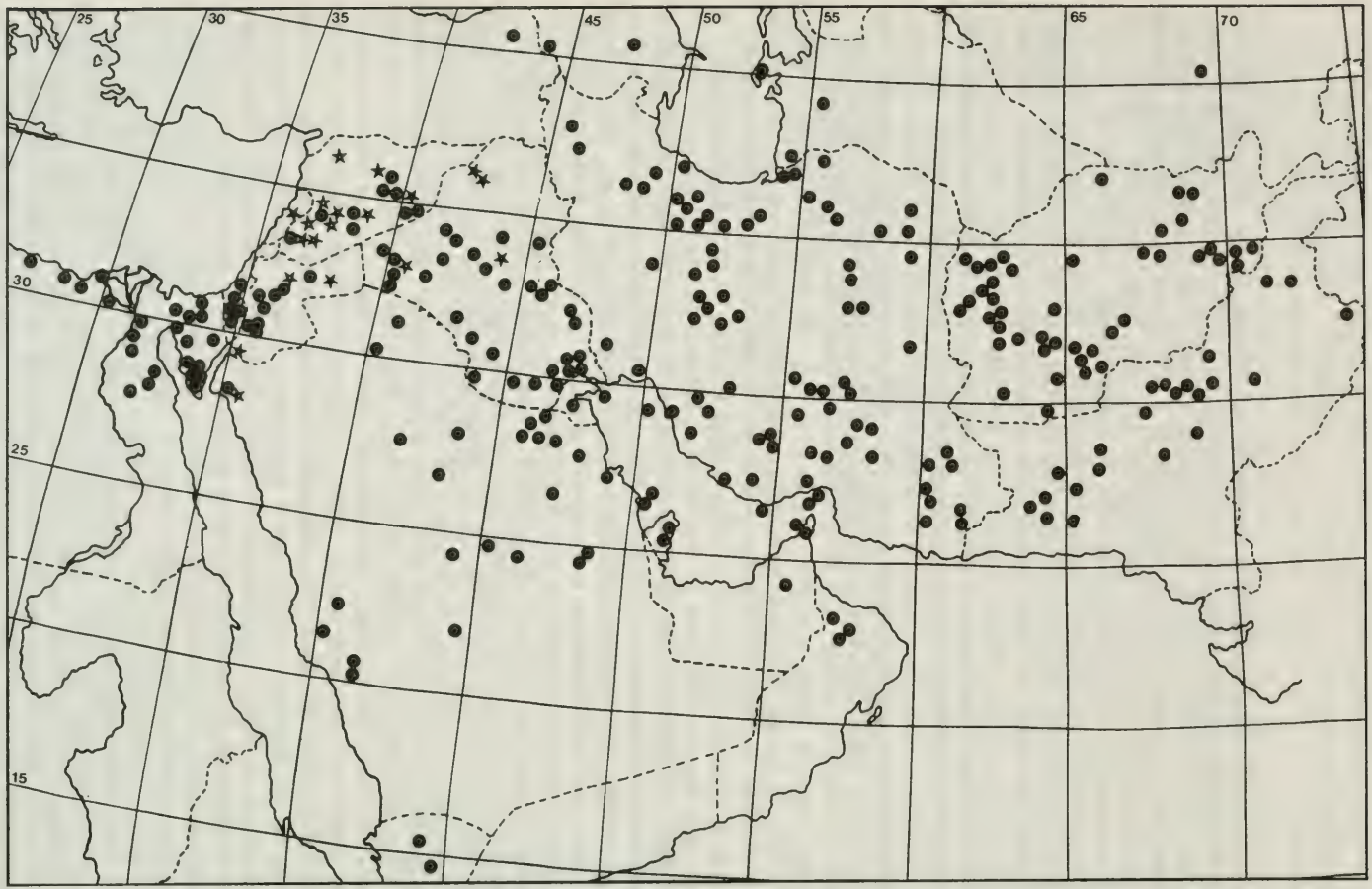
Figures: Flora Armenii 4: 159, tab. 33. 1962. - ZOHARY, M., Fl. Palaestina 2, part 2: tab. 73. 1972.

Plants annual, branched at the base, covered with adpressed to semipatent white 0,2-1,5 mm long hairs, rarely plants nearly glabrous. Stems from nearly absent up to 40 cm long, prostrate to ascending, pilose. Stipules membra-neous, 2-3 mm long, narrowly triangular-acuminate, very shortly adnate to the petiole, otherwise free, pilose, sometimes with very few black hairs. Leaves 1,5-7 (-9) cm long; petiole 0,5-2 cm long, like the rachis adpressed to semipatent pilose. Leaflets (3-) 4-9 (-10) paired, 2,5-9 (-15) mm long and 0,8-2 (-4) mm broad, narrowly elliptic, mostly acute, rarely obtuse at the apex, covered on both sides with sericeous adpressed hairs. Inflorescences sessile, rarely with a peduncle up to 2,5 cm long, with (1-) 2-8 flowers in a dense head. Bracts membraneous, 1-2 (-3) mm long, narrowly triangular, acute, white ciliate. Flowers nearly sessile or with a pedicel up to 0,5 mm long.Calyx 3-5 mm long, tubular, densely pilose; teeth subulate, 1-2 mm long, shorter than the tube. Corolla whitish or white suffused with mauve or pink. Standard 4-10 mm long, 1,2-2,5 mm broad, narrowly oblong, retuse at the apex. Wings 4-6 mm long, the limb narrowly oblong, notched at the apex, 1,5-2,8 mm long and 0,8-1,1 mm broad; auricle ca. 0,5 mm long, claw 2-3 mm long. Keel 3-5 mm long, the limb triangular-obovate, 1-2,5 mm long, with lower edge strongly rounded and upper edge slightly curved; auricle very short, claw 2-2,5 mm long. Staminal tube straightly cut. Ovary sessile, hairy; style glabrous. Legumes sessile, mostly star-like spreading, straight or slightly curved, oblong-triangular, distinctly bigibbous at the base, acute at the apex, 4-12 mm long, 2,5-3,5 mm high and 1,5-4 mm broad, carinate on ventral side, deeply grooved on dorsal side, covered with adpressed short hairs 0,05-0,15 mm long and also with much longer adpressed to subadpressed hairs up to 1,5 mm long. Pods opening along the ventral suture, completely bilocular. Seeds 4-10 (-12) in each locule, kidney-shaped, 1-2 mm long and 1-1,5 mm broad, pale brown, smooth. **Flowering time:** nearly all the year after raining season. **Occurence:** in steppe or semidesert or nearly desert places, from the plains up to 3000 m.

Distribution: Egypt, Turkey, Syria, Israel, Jordan, Saudi Arabia, Kuwait, Bahrain, Qatar, United Arabic Emirates, Oman, Yemen Arabic Republic, Iraq, Armenia, Kazakhstan, Turkmenia, Uzbekistan, Tadzhikistan, Iran, Afghanistan, Pakistan, India. Map 20.

Specimens seen:

Egypt. Marmarica, El Omaied, 16.3.1930, *Gauba* (W) - El-Dabaa, 25 km NW of El Alamein, 9.3.1990, *Gazer* (SUEZ CANAL UNIV.) - Bourg-el-Arab, 23.4.1925, *Simpson 3428* (K) - dto., 8.3.1990, *Gazer* (SUEZ CANAL UNIV.) - El Hauwa-riya, between Ikingi Maryut and Burg-el-Arab, 7.3.1990, *Gazer* (SUEZ CANAL UNIV.) - Alexandria, 28.3.1853, *Samari-tani* (Samaritani delectus plantarum Aegypti inferioris curante Th. Heldreich) *3437* (P) - dto., *Scott 3668* (BM) - ad Mariout, 24.3.1878, *Letourneux* (P) - aad lacum Mareo-tidem occidentem versus, *Letourneux 48* (K, P, W) - Manda-ra, prope Alexandriam, 4.4.1877, *Letourneux 48a* (B, K, P, W) - near the Amria causeway, 22.4.1927, *Simpson 4738* (K) - Amria, 15.3.1945, *Davis 8395* (K) - dto., 26.3.1946, *Gilbert 454* (BM) - El-Amiriya S of Alexandria, 19.3.1989, *Gazer* (SUEZ CANAL UNIV.) - Mersa Matruh, 9.3.1990, *Gazer* (SUEZ CANAL UNIV.) - Ras-el-Hekma, 40 km S Marsa Matruh, 8.3.1990, *Gazer* (SUEZ CANAL UNIV.) - Cairo-Alexandria desert road, 180 km from Cairo, 16.4.1967, *Täckholm & al.* (CAI) - S Wadi Machasche (S Helouan), 22.3.1884, *Cramer 186 - dto., III.1890, E.Burdet 227* (G) - *SE d'Helouan, 19.3.1885, Cramer* (G) - a lateral of Wadi Hof above the sea, 15.6.1922, *Simpson 1066* (K) - wady on watershed between Nile and Wady Arabah, 26.3.1928, *Simpson 5876* (K) - at the road from Abu-Rdise to Ismailia, 7 km before Hamam, 30.3.1989, *Gazer & Gamal-Eldin* (SUEZ CANAL UNIV.) - Wadi Chafura [= Khafâri] N Galata, 12.4. 1887, *Schwein-furth* (BM) - dto., 10.9.1924, *Simpson 2734* (K) - Wadi Ma' agraf, N Galata, 9.4.1924, *Simpson 2709* (K) - W. No'oth, N Galata, 4.4.1924, *Simpson 2624* (K) - N. Galala, Wadi Nooz, between the mouth and Wadi Um Retama, 27.3.1944, *Davis 7035* (HUJ) - Ramses, Theben, 19.2.1877, *Letourneux* (P) - Daba'a, 3.1.1927, *Simpson 4649* (K) - Gebel Yammam el asmar, 5.3.1945, *Davis 8275* (K). -- Sinai: El-Arish, 1.5.1925, *Eig* (HUJ) - dto., 2-3 hours SE, 2.5.1925, *Eig & al.* (Hb. PODL.) - Wadi El Arish, Hennaah, 16.5.1887, *Ascherson 919* (P) - Al Arish, Ramleh-el-Eckfen, 14.5. 1887, *Ascherson 920* (P) - 1 km E bir Gifgafa, 5.3.1968, *Danin & al.* (HUJ) - 20 km W of Nizzana at road to El Arish, 130 m, 2.5.1991, *Förther 4166* (Hb. FÖRTHER) - Jebel Maghara, N'side, 4 km S from the main road towards the coal mine, 280 m, 3.5. 1991, *Podlech 50094* (Hb. PODL.) - 13 km NW Quseima near road to El Arish, 220 m, 2.5.1991, *Podlech 50008* (Hb. PODL.) & *Förther 4212* (Hb. FÖRTHER) - 2 km NW of Gidda pass, ca. 650 m, 5.5.1991, *Förther 4314* (Hb. FÖRTHER) - Gebel Halal, 23.4.1975, *Danin* (HUJ) - Wadi El Butum, 20 km S of Thamad, 12.3. 1970, *Schmida & Ager 53772* (HUJ) - En-Nakhl, 9.6.1967, *Danin* (HUJ) - Wadi El Butum, 20 km SE Thamad, 12.3.1970, *Schmida & Ager 53772* (HUJ) - Gebel Igma, Ras Gineina, 1500 m, 9.10.1969, *Danin & Halevy* (HUJ) - Gebel Igma, Ras Ragum, 1500-1600 m, 22.11. 1969, *Tadmor* (HUJ) - Gebel Igma, Wadi Shibeiha, 1300-1350 m, 11.10.1969, *Danin & Halevy* (HUJ) - Gebel Igma, env. of Gebel Khudara, 1250 m, 26.6.1969, *Danin & Halevy* (HUJ) - upper Wadi Gh'arba, 27.8.1969, *Tadmor* (HUJ) - road between Abu Rudies and Ras Sudar, turn to Hamam Far'an, IV. 1969, *Evenari* (HUJ) - 10 km N Feiran oasis, Farsh Zebir, 25.5.1969, *Tadmor* (HUJ) - Wadi Feiran, 4 km E Oasis Feiran, 660 m, 27.4.1991, *Pod-lech 49727* (Hb. PODL., Hb. FÖRTHER) - Wadi el Sheikh near Sahab area, 17 km E Oasis Feiran, 770 m, 27.4.1991, *Podlech 49744* (Hb. PODL.) - Gebel Khizeimiya, 100-1800 m, 23.3.1968, *Danin & al.* (HUJ) - Wadi Tlah, 9 km NW St. Catherine monastery, 25.3.1968, *Danin* (HUJ) - near Sheikh Awad, 10 km NW St. Catherine monastery, IV. 1979, *Danin* (HUJ) - 2 km W St. Catherine monastery, 1.4. 1971, *Danin* (HUJ) - St. Catherine monastery, 1480 m; 26. 4.1991, *Podlech 49694* (Hb. PODL., Hb. FÖRTHER) & *Förther 3949* (Hb. FÖRTHER) - mt. St. Catherine, 2000 m, 16.4.1937, *Schabe-tai 289.726* (K) - dto., 28.4. 1991, *Podlech 49790* (Hb. PODL.) - garden of Deir el Arbain, 23.4.1961, *Täckholm & al.* (CAI) - inter rupes montis Sinai, 8.4.1835, *Schimper 181* (G, HAM, K, P, W) - dto., *Aucher-Eloy 1309* (G-Bois, K) - Wadi Roteg, 10 km S St. Catherine, 1700-1800 m, 29.4.1970, *Reichenstein* (HUJ) - Wadi Isla, IV.1940, *Has-sib* (CAI) - near Gebel Umm Shomar, Wadi Buraqa, 26.4. 1968, *Danin & Shmida* (HUJ) - Gebel Umm Shomar, Wadi Rum-han, 28.4.1968, *Danin & Shmida* (HUJ) - Wadi Zara'a, 2 km N Zeitunda, 26.4.1968, *Danin & Shmida* (HUJ) - Wadi Torfa, 31.3.1902, *Kneucker* (B) - Sheikh el 'Arab, Umm Ermem, VIII.1926, *Kaiser 26* (G) - Abu Hashieh,



Map 20. Distribution of *Astragalus tribuloides*
● var. *tribuloides*, ★ var. *thapsacenus*

15.3.1928, *Kaiser 50* (G) - Sil Sahib, 5.2.1928, *Kaiser 96* (G) - Abu Hamei-ta, 3.10.1926, *Kaiser 781* (G). -- Not exactly to locate: Egypte, *Delile* (MPU, P) - in Aegypto inferiore, IV.1836, *Kotschy 710* (W) - inter Suez et Sinai, III.1846, *Boissier* (G, K).

Turkey. Prov. Kars: 16 km from Igdir to Tazluca (Aras valley), 920 m, 25.5.1966, *Davis 43560B* (K, M).

Syria. region d'Alep, IV.1936, *Mouterde 4788* (G) - Regio damascena, Kissoué, 720 m, 20.4.1965, *Roessler 4964* (M) & *Roessler 397* (M) - Damas, Salahié, 13.4.1894, *Peyron* (P) - Qaryatein, 1943, *Davis* (K) - dto., 8.5.1953, *Pabot* (G) - dto., 23.4.1934, *Mouterde 3813* (G) - N Bir Aaleya-miye (piste Palmyre - Saba Biar), 2.5.1956, *Pabot* (G) - Palmyre, 4.4.1944, *Mouterde 8146* (G) - dto., 18.4.1943, *Davis 5839* (K) - dto., 2.4.1955, *Pabot* (G) - dto., 16.4. 1965, *Doppelbaur 132* (M) - SE Palmyre, 5.5.1901, *Post* (B) - S du Jebel Bichri, 25.4.1956, *Pabot* (G) - prope Der es Sor [= Dayr az Zaur], 200 m, 30.3.1910, *Handel-Mazzetti 584* (W) - N Deir ez Zor, 27.4.1956, *Pabot* (G) - 15 km SW Deir ez Zor, 25.4.1956, *Pabot 877b* (G) - 33 km SW Deir ez Zor, 30.4.1933, *Eig & Zohary* (HUJ) - wadi à l'E de T2 (oil pumping station), 1.5.1956, *Pabot* (G) - Al Bu Kamal, at the Iraqi border, 230 m, 6.3.1955, *Helbaek 251* (C) - Wadi Ratqa (Al Bu Kamal), 1.5.1956, *Pabot* (G).

Israel. Jerusalem, V.1857, *Roth 353* (M) - dto., Good Samaritan's Inn, 800 m, 25.3.1912, *Meyers & Dinsmore 8501* (G) - Negev, Wadi El-Baqqara, 28.3.1945, *Tadmor* (HUJ) - env. of Khalisa, near Wadi Sini, 29.3.1942, *Zohary* (HUJ) - 4 km S Beersheba, 14.4.1928, *Eig & al.* (HUJ) - 15 km SE Beershava, Wadi Mashash Farm, 23.3.1987, *Hepper 8703* (K) - 25-28 km E Beersheba, 26.3.1961, *Zohary* (HUJ) - Revivim to Beersheba, 27.4.1950, *D'Angelis* (HUJ) - Rivi-vim, 14.4.1949, *Jaffe* (HUJ) - Asluj [= Beer Masha], 15. 4.1949, *Zohary* (HUJ) - Mishor Ha Rochut, 1 km E Bor Niz-zana, 6.4.1983, *Liston & Danin 7-83-42/6* (HUJ) - Kefar Jeroham, 8.4.1950, *Zohary & D'Angelis* (HUJ) - opposite Kibbutz Sde Boqer, 22.3.1983, *Liston 7-83-23/7* (HUJ) - Negev, Avdat, 14.4.1976, *BRECKLE 4227* (Hb. PODL.) - Borot Loz, 6.4.1983, *Liston & Danin* (HUJ) - 4 km E Kunrub to Sedom, 2.4.1952, *Orshan* (HUJ) - 21 km from Kurnub Police station, Jebel Azalga, 26.5.1934, *Eig & al.* (HUJ) - Tureibeh Plain [= Mishor Yamin], 15.3.1956, *Zohary* (HUJ) - Makhtesh Hatira [= Makhtesh Ha Gadol], 23.3.1950, *D'Angelis* (HUJ) - dto., 13.3.1961, *Feinbrun* (HUJ) - Makhtesh Wadi Ramon, 30.3.1945, *Zohary* (HUJ) - Ramon plateau near Naqb Servit, 30.3.1945, *Tadmor* (HUJ) - Wadi Ramon, Naqb 'Arud, 24.4.1950, *Zohary & D'Angelis* (HUJ) - Dead Sea, En Gedi, 4.5.1951, *Zohary & D'Angelis* (HUJ) - Dead Sea, Meitsad Tamar, 17.3.1974, *Zohary* (HUJ) - Hamei-shar, 3.3.1962, *Zohary & Orshan* (HUJ) - Arava valley, 8 km N Ein Ghadian, 25.3.1950, *Zohary* (HUJ) - Arava valley, Nahal Shezav, near Hazeva, 27.2.1986, *Liston 473/6* (HUJ) - Arava valley, Nahal Nekarot, 1 km N Ein Yahav, 23.3. 1983, *Liston 7-83-27/1* (HUJ) - Arava Valley, 3 km N Ein Hosb, 24.3.1950, *Zohary* (HUJ) - 120 km N Eilat, 13.3. 1951, *Orshan & Zohary* (HUJ) - 53 km N Eilat, 13.3.1951, *Orshan & Zohary* (HUJ). -- Under Israelian administration: Han Hatrur, 19,5 km from Jerusalem on Jericho road, 28.2. 1935, *Eig & al.* (M) - 22 km from Jerusalem on the Jeri-cho road, 28.2.1935, *Amdursky & Grizi*, Fl. Palest. exs. *341* (B, BM, G, MA, P, W, Hb. PODL.) - 28 km from Jerusalem on Jericho road, 22.2.1935, *Eig & al.* (HUJ, Hb. PODL.) - Wadi Fuar, 27.3.1935, *Eig & al.* (HUJ) - vallée d'Achor près Jericho, 8.4.1880, *Barbey 317* (P) - Dead Sea, Wadi Daraja to Ras Feshha, 26.3.1926, *Eig & Zohary* (HUJ).

Jordan. prope H5 (oil pumping station), 163 km from Amman to Rutba, 27.5.1957, *Rechinger 12960* (W) - 22 km NE H5, along Mafraq road, 9.4.1974, *Boulos & al. 6813* (K) - 17 km NW Ashraq Shishan, 600 m, 19.4.1965, *Townsend 65/136* (K) - 30 km W Azraq, 3.4.1980, *Frey & Kürschner 80-139* (HUJ) - 6 miles W Azraq Shishan, 17.4.1965, *Town-send 65/97* (K) - Wadi Aseimir, 12 km W Azraq, 17.4.1965, *Townsend 65/81* (K) - Wadi el Aseimir, just E of Qasr Amra, 3.5.1965, *Townsend 65/363, 364* (K) - Azraq oasis, 25.4.1974, *Boulos & al. 7046* (K) - dto., near the hot spring, 1.3.1973, *Boulos 5257* (BM) - Shaubak experimental farm, 28.4.1963, *Gillett 15888* (G) - Moav, Ziza to Qatra-ni, near Qatrani, 15.4.1929, *Eig & Zohary* (HUJ) -Wadi-el-Hasa near Qal'at-el-Hasa, 800 m, 28.3.1936, *Eig & al.* (HUJ) - Wadi Ram, 14.4.1945, *Davis 10439* (K) - Wadi Irhin, 14.4.1945, *Davis 9291* (K) - Ma'an, 21.6.1909, *Nabélek 3054* (Foto: K) - Anza to Ma'an, 16.4.1929, *Eig. & Zohary* (HUJ) - Wadi Musa, 17.4.1929, *Eig & Zohary* (HUJ) - Ein Musa to Petra, 17.4.1929, *Eig & Zohary* (HUJ) - Petra, 17.4.1929, *Eig & Zohary* (HUJ) - dto., 17.4.1945, *Davis 9147* (K) - dto., 800-900 m, 11.3.1967, *Hepper 3104* (K) - 26 km S Ma'an, 18.4.1929, *Eig & Zohary* (HUJ) - 40 km S Ma'an, 18.4.1929, *Eig & Zohary* (HUJ) - Wadi Araba, 50 km S Ghor Safi, 9.2.1978, *Al-Eisawi 2389* (BM) - Jebel Aneizi (= Uneiza), Edom, 22.4.1943, *Davis 9226* (K) - 40 km N Aqaba, 18.4.1929, *Eig & Zohary* (HUJ).

Saudi Arabia. N' Hijaz, W of Shigro, off Sawawin - Tabuk road, 3000', 2.3.1977, *Collenette 920* (K) - 10 km NW Shiqri on Tabuk road, 13.3.1986, *Collenette 5745* (K) - Kuneitra, 10 km NW Sakaka, 12.3.1984, *Heemstra 7322* (RIY) - Al Jauf, 1 mile NE Sakaka, 1800 m, 17.2.1911, *Wood W/34* (BM) - Badanah pump station, 20.7.1964, *Mandaville 274* (W) - dto., 28.8.1964, *Mandaville 299* (W) - 3 km ESE Ash Shumlul (Ma'qala), 11.3.1970, *Mandaville* 2820 (BM) - 4-corner boundary pt. al-Batin-al-Awja, 21.3.1968, *Mandaville 1575* (BM) - 36 km NE Hafar-al-Batin, 21.3.1968, *Mandaville 1536* (BM) - 30 km ESE Qaisumah, 21.3.1968, *Mandaville 1525* (BM) - 27 km WSW Qaisumeh, 26.3.1981, *Hillcoat 311* (BM) - 2 km S Saudi - Kuwait border at 47° 06' E, 21.3.1968, *Mandaville 1630* (BM) - 2 km S Saudi - Kuwait border at 47°14' E, 22.3.1968, *Mandaville 1655* (BM) - Hail, *Chaudary 9345, 9349* (RIY) - near Zabirah, ca. 200 km N Buraydah, 1800', 21.4.1981, *Colenette 2480* (K) - Abu Hadriyah, 23.3.1968, *Mandaville 1771* (BM) - Jilh al Ishar, Najd, 1.4.1964, *Mandaville 210* (BM) - 2 km SE Dir'-iyah, 20.2.1969, *Mandaville 2016* (BM) - Al Suman, 28.2.1969, *Mandaville 2194* (BM) - 15 km WSW Al Hunayy, 1.3.1969, *Mandaville 2234* (BM) - near Barzah, between Jiddah and Wadi Khnylais, 500', 8.3.1982, *Collenette 3363* (K) - Birkah, 21.3.1969, *Popov 69/114* (BM) - Al Taif, 2000 m, 26.2.1971, *Wood 80* (BM) - Taif area, I.1966, *Wardhaugh 9* (BM) - Jebel al Ahmar, 143 km SW Buraydeh, 3800', 13.2.1980, *Collenette 1811 pp.* (E) - near Jabal Ibrahim, off the Taif - Abha road, 6500', 18.4.1982, *Collenette 3556* (K) - near Aqiq, E Al Bahah, 4800', *Collenette 3391* (K) - Dawadimi camp, 24°33' N - 44°13' E, 5.3.1983, *Collenette 4077* (K).

Kuwait. on the Salny road, 72 km from Kuwait, Univer-sity Khaldah, 16.5.1981, *Rawi & al. 10257* (G, M) - Araf-jan, 26.2.1935, *Muleson 89A* (K) - Falaicha Island, 20.3. 1938, *Dickson 419* (K).

Bahrain Islands. Bahrain Islands, 7.3.1950, *Good 116* (K) -Bahrain, 15 m, III.1981, *Bellamy 16* (K) - N Awali, 23.3.1950, *Good 111* (K) - wadi 1/2 mile E Ali, 4.3.1950, *Good 115* (BM, K) - Naran Island, 26.3.1950, *Good 112* (BM, K).

Qatar. Qatar, northern road, *Elamin 9* (K) - Al Kharra-rah, 5 km towards the Northeast, 2.4.1977, *Boulos 11093* (K) - 20 km S Doha, Um Said road, 7.4.1975, *Bajwa 1023-75* (BM) - Wakra, 20.4.1982, *Elamin 84* (K) - half way to Ta-niliyat, 17 m, 19.4.1971, *Wilcox 128* (K) - Umm Shal Ali, 25 km N Doha, 29.3.1977, *Boulos 10929* (B, G, K) - Snana-nia, 1.5.1982, *Elamin 159* (K).

United Arabic Emirates. Ras al Khaima, Digdaga, XII. 1972, *Tyler* (BM).

Oman. Musandam Peninsula, Birkat al-Khalidiyah near Sallalah, 25.2.1979, *Mandaville 7197* (BM) - Wadi al-'Ayn, near Simah, 25.2.1979, *Mandaville 7189* (BM) - Buraimi, XII.1948, *Thesiger* (BM) - near Masjid Mu'alla, 11.4.1975, *Mandaville 6466* (BM) - Jabal al Akhdar near Halyaman, 17. 3.1972, *Mandaville 3554* (BM) - Nizwa Agric. Inst. Firq, 19.12.1981, *Maconochie 3037* (K) - El Kharran, 20.11.1950, *Guichard KG/119* (BM).

Yemen Arabic Republic. between Shemlaan and Sana'a, 8.12.1975, *Wood 75/976* (BM) - Damar, 7.11.1983, *Bisset 292* (K) - near Kankaban, 3000 m, 1.6.1977, *Wood 1681* (BM) - 30 km S Saqf, near Banana, 11.3.1962, *Zeller 5506* (BM).

Iraq. Kirkuk Distr. (FKI): ad Kerkuk, 28.4.1893, *Bornmüller 1202* (B). -- Persian Foothills Distr. (FPF): 16 km SE Badra, 12.4.1957, *Rechinger 13939* (W) - Jabal Hamrin inter Sharaban [= Muqdadîya] et Jalaula, 4.4.1957, *Rechinger 9007* (W) - 30 km SE Badra, 12.4.1957, *Rechinger 9150* (W). -- Lower Jazira Distr. (DLJ): 70 km NW Falluja, 75 m, 7.4.1961, *Rawi 30358* (K) - 40-50 km W Samarra, 10 km N Sheikh Mohammed, 4.5.1957, *Rechinger 9602* (W). -- Ghurfa-Adhaim Distr. (DGA): 4 km E Samarra, 4.5.1957, *Rechinger 9547* (W). -- Western Desert Distr. (DWD): 12 km N T1, *Chakravarty & al. 31717* (K) - 5 km S Anah, 14.4. 1969, *Omar & Hamid 36616* (K) - between Muhaiwir and Rut-ba, 7.5.1954, *Rawi 23723* (K) - 13 km E H 3 (oil pumping station), 680 m, 10.4.1964, *Rawi & al. 32948* (K) . 35 km W Rutba, 600 m, 7.6.1957, *Rechinger 9922b* (W) - 20-25 km W Rutba, 7.6.1957, *Rechinger 12545* (G, M, W) - 20 km W Rutba, 11.3.1955, *Rawi 14675* (K) - 10 km SW Rutba, 7.6. 1957, *Rawi 21094* (K) - 65 km N Rutba, 2.3.1962, *Rawi & Khatib 32255*(K) - 30 km N Rutba, 29.3.1962, *Chakravartyi & al. 31480* (K) - 25 km N Rutba, 3.3.1962, *Rawi & Khatib* 32343 (K) - 12 km NE Rutba, 22.4.1961, *Rawi 31191* (K) - Rutba, 10.3.1955, *Rawi 14654, 14667* (K) - 3 km SE Rutba, 7.6.1957, *Rechinger 9856* (B, M, W) - 9 km S Rutba, 13.3. 1962, *Abbas & Barkley 966* (G, K) - Almasad, 15 km S Rutba, 1.3.1962, *Rawi & Khatab 32187* (K) - dto., 1.4.1964, *Chakravarty & al. 32848* (K) - 18 km S Rutba, 10.3.1955, *Rawi 14640* (K) - 20 miles S Rutba, 21.4.1933, *Meinertzhagen* (BM) - Wadi Al Walaj, 75 km SW Rutba, 8.6.1957, *Rechinger 12565* (W) - Hazimee, 40 km SE Rutba, 13.4.1966, *Omar 34217* (K) - 235 km W Ramadi versus Rutba, 6.6.1957,

Rechinger 9826 (W) - 210 km W Ramadi, 6.6.1957, *Rechinger 12661* (W) - Ramadi, IV.1918, *Graham 75, 77* (BM) - Wadi al-Ghadhaf, between Rutba and Nukhaiba, 11.3.1955, *Rawi 14724, 14729* (K). -- Southern Desert Distr. (DSD): Nakha-ila, 40 km SW Basra, 10 m, 25.3.1957, *Rechinger 14307* (W) - Wadi al-Khirr, 15 km W Lusuf (ca. 100 km NNW Shabicha), 320 m, 26.4.1957, *Rechinger 13570* (W) - Wadi al-Khirr, 90 km NNW Shabicha, 330 m, 26.4.1957, *Rechinger 13606* (W) - 40 km WNE Shabicha, 25.4.1957, *Rechinger 13633* (W) - 35 km SE As-Salman, 210 m, 22.4.1957, *Rechinger 9327b* (W) - 30 km E As-Salman, 190 m, 22.4.1957, *Rechinger 9272* (G, M) - 8-15 km NW Aidaha (ca. 90-95 km SW As-Salman, 410 m, 24.5.1957, *Rechinger 13723* (W) - 50 km NW Aidaha, 25.4. 1957, *Rechinger 9417* (W) - prope Jumaima, 140 km SW As-Salman, 390 m, 22.4.1957, *Rechinger 13749* (W) - prope fontem Jalib Bakur, 95 km SSE As-Salman, 310 m, 22.4. 1957, Rechinger 13844 (W) - 10 km SSE Jiraibiyat, 125 km SSW Basra, 175 m, 24.3.1957, *Rechinger 14425* (W) - NE Ghazlani, 105 km SW Bazra, 24.3.1957, *Rechinger 14352* (W) - prope Jarishan, ca. 90 km SW Basra, 24.3.1957, *Rechinger 14445* (W) - ad confines Kuweit, Shaib-al-Bahim Jari-shan, 24.3.1957, *Rechinger 14450b* (W) - Shaiba, II.1919, *Graham 551* (BM) - Zubair, 19.3.1957, *Rechinger 15903* (W) - 29 km SW Zubair, 8.4.1933, *Eig & Zohary* (HUJ) - 18 km SSE Zubair, 23.3.1957, *Rechinger 14551* (W) - Um Qasr, 40 km SSE Zubair, 23.3.1957, *Rechinger 14529* (W) - Jabal Sanam, 24.3.1957, *Rechinger 14503* (W). -- Eastern Allu-vial Plain Distr. (LEA): ad bifurcationem viae Kut-Amara versus Badra, 12.4.1957, *Rechinger 9114a* (W) - 60 km N Amara, 27.3.1957, *Rechinger 14272* (W) - Nahrwan, 1955, leg. ? (K). -- Central Alluvial Plain Distr. (LCA): Babylonia, 20.4.1893, *Bornmüller 1203* (B). -- Southern Marsh Distr. (LSM): 15 km N Amara, 27.3.1957, *Rechinger 14291* (W). -- Basra Estuarine Distr. (LBA): Kibasi, 10 km N Basra, 22.3.1957, *Rechinger 8652* (M, W) - Basra, Ashar, 16.3.1957, *Rechinger 8413* (W).

Armenia: Distr. Oktemberjan (W of Erevan), 7.6.1959, *Aslanjan & al.* (K).

Azerbaydzhan: Dzhevatskij, (SE Schirvan), 15.4.1915, *Majorov* (W).

Turkmenia: Prov. Krasnovodsk: Krasnovodsk, 20.4.1901, *Sintenis 1568* (B, G, P) - Kazandzhik, 28.4.1901, *Sintenis 1596* (BM, K) - between Kyzyl-Artek and Madau, 3.6.1972, *Frantzkevich* (K, W).

Tadzhikistan: Prov. Leninabad: Mogoltau, 760 m, 6.5. 1948, *Sidorenko 154* (BM) - Montes Mogoltau, prope sepulcrum Boj-bogusch-ata, 10.5.1924, *Popov & Vvedensky*, Herb. Fl. Asiae Mediae *21* (B, G, HUJ, K, MA, P, W).

Iran. Prov. Azerbaidjan-e Gharbi: distr. Khoi ad Seid-chadschi et prope urbem Khoi, *Szovits 188* (K, M) - Khoi, 27.4.1884, *Knapp* (B) - 10 miles E Khoi, 10.5.1963, *Bowles Sholarship Bot. Exp. 1494* (K) - 20 km NE Khvoy, 1100 m, 8.6.1971, *Rechinger 41440* (W). -- Prov. Azerbaidjan-e Sharqi: Tabris, 4000', 5.5.1963, *Bowles Sholarship Bot. Exp. 1274* (K) - S of Tabriz, 1929, *Gilliath-Smith 2500* (K) - NW Bunab, 1500 m, 15.6.1977, *Rechinger 56785* (B, M, W). -- Prov. Gilan: in valle fluvii Sefidrud rope Rudbar, 300 m, 7.5.1902, *Bornmüller 6709* (B) & *6715* (P) - inter rescht et Teheran prope Mendschil [= Manjil], 400 m, 11. 5.1902, *Bornmüller 6714, 6718* (B) - Rudshur, 8.5.1968, *Bonvan 9921* (W). -- Prov. Zanjan: 16 km W Takestan versus Zanjan, 1300 m, 29.6.1971, *Rechinger 42327* (W) - Qazvin, Morad Tappeh, 1210 m, 12.6.1972, *Foroughian & Hariri 15193* (W) - Sultanabad near Kasvin, IV.1935, *Lindsay 187, 192, 194, 309, 336* (BM) - 30 km E Qazvin to Karadj, 22.6. 1965, *Danin & Plitmann* (HUJ). -- Prov. Mazanderan: Garm-sar, 950 m, 11.4.1973, *Babakhanlou & Amin 15562* (W) - Dasht-e Gorgan, 9.5.1948, *Sharif 121* (W) - 65 km from Gomishan to Maravetappeh, 30 m, 21.4.1986, *Assadi & Maas-soumi 55345* (Hb. PODL.) - 26 km from Inche-Boroon to Maravetappeh, 110 m, 21.4.1986, *Assadi & Maassoumi 55389* (Hb. PODL.). -- Prov. Tehran: in ditione jugi Kandavan, *Gauba 659* (W) - Sirachal, 40 km from Karaj to Chalus, 1900 m, 30.7.1973, *Amin 15029* (W) - 38 km W Karaj, 1160 m, 11.6.1973, *Foroughian 15332* (W) - 14 km NW Karaj, N Hasarak, 1445 m, 19.6.1972, *Foroughian & Hariri 15987* (W) - Bibisakineh, W Karaj, 1250 m, 15.6.1972, *Foroughian & Hariri 15124* (W) - Shahdasht 28 km SW Karaj, 1160 m, 5.6. 1972, *Foroughian 15173* (W) - Keredj, 1400 m, 3.5./10.6. 1934, *Bornmüller 25, 25a, 25b* (B) - dto., V.1937, *Rechinger 265* (W) - in valle fluvii Keredj, prope pontem 'Kon-dorbrücke', *Gauba 655* (W) - Kalak prope Keredj, *Gauba 545* (W) - dto., 1350 m, 31.5.1972, *Foroughian 15026* (W) - dto., 26.4.1966, *Zhumer 535* (BG) - prope Teheran, 18.4. 1843, *Kotschy 41* (G, K, M, P, W) - Ray (S Tehran), 1200 m, 27.2.1892, *Bornmüller 3739* (B, P) - S Teheran, 2.4. 1972, *Léonard 5281* (M) - Tehran, Steppe bei Hashemabad, 31.3. 1910, *Bruns 860* (B) - 22 km from Tehran to Garmsar, 1010 m, *Moussavi & Amin 15306* (W) - Bijin, ca. 44 km from Tehran on road to Qom, 1050 m, 20.5.1974, *Shirdelpur & Amini 11580* (K, TARI, W) - Kavir

protected region, Moba-rakiyeh, 40 km S Veramin, 900 m, 22.5.1974, *Rechinger 46121* (G, W). -- Prov. Semnan: ad ripam or. lacus salsi Daryacheh-ye Namak, Howz-e Gheylughey, 18 km S Karavan-Serai Shah Abbas, 900 m, 25.5.1974, *Rechinger 46379b* (W) - Mulkabad, 64 km SE Karavan-Serai Shah Abbas, 900 m, 24.5.1974, *Rechinger 46310* (W, Hb. PODL.) - 18 km N Chashmeh-ye Safid Ab, 900 m, 25.5.1974, *Rechinger 46402* (W) - Chashmeh-ye Safid Ab, 1000 m, 25.5.1974, *Rechinger 46440* (W) - Semnan to Shorkheh, 1160 m, 7.6.1972, *Amin & Moussavi 15522* (W) - Schahrud, V.1858, *Bunge* (P) - inter Maiomei et Shahrud, 13.6.1948, *Rechinger & al. 5314* (B, G, K, M, W) - Turan protected area, Darb-Ahang, 18 km NNE Ahmadabad, 800 m, 29.4.1975, *Rechinger 50699* (W). -- Prov. Khorasan: 82 km from Sabzevar to Mayamey, before Abbasabad, 930 m, 29.4. 1986, *Assadi & Maassoumi 55895* (Hb. PODL.) - E Sabzevar, 14.6.1948, *Rechinger & al. 5286* (W) - Turan protected area, SE Asb Keshan, 1150 m, 2.5. 1975, *Rechinger 50991b* (W) - Robat Sefid, 1700 m, *Gauba 654* (W) - dto., 1800-2000 m, 27.5.1948, *Rechinger & al. 7349* (W) - 22 km N Torbat-e Heydari, 28.5.1961, *Zohary & Orshan* (HUJ) - Turbat-e Haidari, ca. 1300 m, 27.5. 1948, *Rechinger & al. 4368* (W) - 56-60 km N Gonabad, inter Maneh et Emrani, 900 m, 9.5.1975, *Rechinger 51399* (B, W) - inter Asfak et Deh-e Mohammad, W Boshruyeh, 1200 m, 12.5.1975, *Rechinger 51735* (W) - Tabas, Derenjal bei Deh Mahmad, 28.4.1964, *Ruttner 525* (W) - 15 km S oasis Parva-reh, S Tabas, 10. 4.1972, *Léonard 5500* (M) - Sser-tschah, III.1859, *Bunge* (K, P) - Cah Kuh [= Shah Kuh], NE' Rand der Wüste Lut, 1000 m, 17.3.1937, *Gabriel 139* (B) - Est du Dasht-e Lut, N des grandes dunes, 1100 m, 59°32' E - 30°57' N, 15.5. 1972, *Léonard 6227* (BR) - Est du Dasht-e Lut, E des grandes dunes, 1100 m, 59°52' E - 30°37' N, 11.5.1972, *Léonard 6155* (M, W). -- Prov. Markazi: between Zarand et Saveh, 1320 m, 7.6.1972, *Foroughian 15593* (W) - 22 km N Qom, 26.4.1929, *Cowan & Darlington 2675* (K) - Aliabad, inter Teheran et Qom, 1100 m, 29.2.1892, *Bornmüller 3736* (B) - Lac Qom (Howz Soltan), 800 m, 22.4. 1976, *Lambinon 76/324* (Hb. PODL.) - Kom [= Qom], 1200 m, 4.3.1892, *Bornmüller 3738* (B) - E of Arak, 1645 m, 3.5. 1966, *Archibald 1764* (K). -- Prov. Esfahan: 66 km from Qom on road to Kashan, 870 m, 23.5.1972, *Moussavi & Amin 15185* (W) - Kashan, VIII.1893, *Glover* (K) - 18 km S Kashan, 14.5. 1961, *Zohary & Orshan* (HUJ) - 24 km NE Murcheh Khvort, 1750 m, 27.5.1974, *Rechinger 46631* (W) - 85 km NW Ardestan, inter Ab-i Azan et Rahmatabad, 1150 m, 26.5.1974, *Rechinger 46512* (W) - Shahrab, N Ardestan, 900 m, 5.5. 1977, *Amin & Reyamand 32876* (W) - Nedschefabad [= Naja-fabad], 1700 m, 18.3.1892, *Bornmüller 3736* (B) - 40 miles W Isfahan, 22.4.1929, *Cowan & Darlington 2672* (K) - Ispa-han, *Aucher-Eloy 4419* (BM, G, K, W) - dto., 1944, *Iliff 43* (K) - Djulfa [= Jolfa], 20.4.1948, *Rechinger & al. 2665* (W) - ad Gulnabad ditionis Ispahan. 1600 m, 23. 3.1892, *Bornmüller 3737* (B) - entre Dilijan et Ispahan, 24.4.1956, *Schmid 5184* (M) - inter Nain et Ardestan, Zafarqand, 1650 m, 18.5.1975, *Rechinger 52046* (W) , Bam-bis, inter Ispahan et Yesd, 1600 m, 26.3.1892, *Bornmüller 3734* (B) & *3735* (P). -- Prov. Khuzestan: Akhwaz, 22.4. 1940, *Koelz 14960* (W) & 20.4.1940, *Koelz 14908* (W). -- Prov. Bushehr: Insula Khark, 10.3.1976, *Termeh & Moussavi 34545-E* (W) - Lagune von Buschir, bei Suhodar, 21.4.1885, *Stapf* (K) - Bushir, 3.3.1937, *Koeie 179* (W) - 14 km from Cavbandi on road to Bushehr, 100 m, 20.3.1985, *Maassoumi & Abouhamzeh 52003* (Hb. PODL.). -- Prov. Fars: Tang-e Saadatabad, between Shiraz and Abadeh, 28.5.1969, *Termeh & Izadyar 14636-E* (W) - Takht-i-Jamshed, 12.3.1940, *Koeie 14440* (W) - ruines de Persepolis, VI.1936, *Gauba 924* (B) - dto., 2.5.1956, *Schmid 5443* (G) - near Shiraz, *Trott 948* (K) - Maharlu, 1600 m, 5.4.1936, *Gauba 925* (B) - 7 km from Evaz to Lar, 900 m, 16.4.1983, *Assadi & Sardabi 41690* (TARI) . Lar, *Gauba & Sabeti 660* (W). -- Prov. Hormozgan: 73 km from Lar to Bastak, 500 m, 17.4.1983, *Assadi & Sardabi 41860* (TARI) - ad Lingae [= Bandar-e Lengeh], *Bornmüller* (B) - ca. 100 km ESE Lar, near Sar-tang, 300 m, 19.4.1983, *Assadi & Sardabi 41948* (TARI) - S'side of Kuh-e Genou, 1600 m, 4.4.1975, *Wendelbo & Foroughi 1578* (BG, TARI) - Bender-Abbas, 24.2.1893, *Bornmüller 344 pp.* (W) & *348* (B) - 15-20 km E Bandar-Abbas on road to Rudan, 7.4.1975, *Wendelbo & Foroughi 15671* (TARI) - in insula Kischm [= Qeshm], 18.2.1893, *Bornmüller 347* (B, P) - dto., 4.4.1974, *Kunkel 16683a* (K) - insula Hormus [= Hormoz], 5.2.1893, *Bornmüller 346* (B, BM, G, K, P, W) - dto., III.1913, *Popenoe 17* (K) - dto., 30.3.1974, *Kunkel 16362* (K) - Minab, 19.5.1973, *Soják 4744, 4758* (PR). -- Prov. Kerman: inter Anar et Bahrama-bad [= Rafsanjan], 22.4.1948, *Rechinger & al. 2880* (W) - inter Bahramabad [= Rafsanjan] et Kabutarkhan, 22.4.1948, *Rechinger & al. 2896* (B, K, M, W) - W Kabutarkhan, 1.3. 1959, *Merton 3597* (K) - Kerman, IV.1859, *Bunge* (W) - dto., ca. 2000 m, 24.4.1892, *Bornmüller 3739, 3742* (B, K, W) & *3740* (B) & *3741* (B, BM) - inter Saidabad (Sirdjan) et jugum Choghuk (Chafut), 1700-1900 m, 28.4.1948, *Rechinger & al.*

3109 (B, G, K, M, W) - inter Mashiz et jugum Khan-e Sorkh, 2000-2580 m, 27.4.1948, *Rechinger & al. 3033* (K, M, W) - inter Baghin et jugum Sangpur (Gudar-e Dokhtar), 27.4.1948, *Rechinger & al. 2974* (G, K, W) - 13 km SW Kerman, 29.4.1973, *Soják 2790* (PR) - bet-ween Mahan and Kerman, 6.5.1977, *Assadi 23285* (TARI) - Khatunabad, 70 km NW Bam, 25.4.1973, *Soják 2684, 2686* (PR) - 2 km from Darzin on road to Jiroft, 1380 m, 14.4. 1975, *Foroughi 15895* (W) - Montes Djamal Bariz inter Bam et Djiroft, infra Deh Bakri, 1800 m, 8.-10.5.1948, *Rechinger & al. 3677* (B, G, K, W) , inter Jiroft et Gav Koshi, ca. 44-55 km W Jiroft, 1500-1700 m, 7.5.1973, *Soják 4251* (PR) - Hosseiabad, 32 km S Jiroft towards Bolouk, 9.3.1986, *Termeh & Moussavi 41582* (W) - Djas Muriyan, ca. 400 m, IV.1950, *Starmuehlner 95* (W). -- Prov. Baluchestan: Kuh-e Taftan, in valle Tamindan, 2100-2300 m, 18.4.1973, *Soják 2219* (PR) - ca. 63 km NNE Baza-man ad viam versus Eskelabad, 14.4.1973, *Soják 2050* (PR) - 12 km SSE Bazman, 13.4.1973, *Soják 1956* (PR) - Iranshah to Bazman, 6.3.1949, *Sharif 595-E* (W) - Khash, 18.2.1949, *Sharif 593-E* (W) - E Khash, 28.3.1973, *Soják 493, 496* (PR) - Khash, Sohrabadad, 28.2.1949, *Mirzagan 582-E* (W) - 9 km NW Pskuh, 29.3.1973, *Soják 597* (PR) - Qasimabad, ca. 10 km W Bampur, 11.4.1973, *Soják 1788* (PR) - 31 km SW Espakeh, 10.4.1973, *Soják 1642* (PR) - 74 km from Sarbaz on road to Zabeli, 1280 m, 11.3.1974, *Foroughi 10793* (TARI) - Sakand, 10 km ENE Sarbaz, 1.4.1973, *Soják 947* (PR) - Rask, 9.5.1974, *Foroughi 10743* (TARI) - Umgebung von Chahbahar, *Pozdena 21b* (W).

Afghanistan. Prov. Herat: 90 km from Eslam Qala to Herat, 950 m, *Kukkonen 5865, 5872* (H) - 81 km WNW Herat an der Straße nach Eslam Qala, 800 m, 27.4.1977, *Podlech & Jarmal 29373* (Hb. PODL.) - 35 km W Herat an der Straße nach Eslam Qala, 840 m, 27.4.1977, *Podlech & Jarmal 29336* (G, M, Hb. PODL.) - 15 km W Herat, 1100 m, 26.4.1977, *Podlech & Jarmal 29331* (Hb. PODL.) - 10 km E Herat on road to Obeh, 24.4.1971, *Gibbons 89* (K) - Qala-i-Sharbat, 50 km ENE Herat an der Straße nach Qala-i-Naw, 1350 m, 2.5.1977, *Podlech & Jarmal 29714* (Hb. PODL.) - Harirod Tal bei Tagabe Sur, 25 km E Obeh, 1390 m, 1.5.1977, *Podlech & Jarmal 29660* (Hb. PODL.) - 35 km S Herat on road to Kandahar, 1400 m, *Kukkonen 5912* (H) - S'Hänge des Mir-Alam Passes, 11 km N Adraskan an der Straße nach Herat, 1450 m, 25.4.1977, *Podlech & Jarmal 29221* (Hb. PODL.). -- Prov. Baghlan: 1 km W Doshi, 900 m, *Kukkonen 6470 pp.* (H) - unteres Andarab Tal bei Gazan, 6 km W Khinjan, 1030 m, 21.4.1971, *Podlech 20419* (Hb. PODL.). -- Prov. Bamian: Band-i-Amir, 3000 m, 1970, *Dieterle 871* (Hb. PODL.) - Drachental bei Bamian, 2600 m, 8.7.1969, *BRECKLE 2345* (Hb. BRECKLE) - 8 km E Bamian an der Straße nach Bulola, 2400 m, 13.5.1970, *Podlech 22189* (Hb. PODL.) - Paimuri gorge, 2700 m, *Hedge & Wendelbo W.4700* (BG) - Doab [i-Mekhe Zarin], 1440 m, 21.4.1962, *Hedge & Wendelbo 3442* (BG). -- Prov. Kabul: N Kabul, 1800 m, 20.6.1962, *Rechinger 17020* (W) - NW Kabul on Charikar road, 1800 m, *Hedge & Wendelbo W.4343* (BG) - Kabul, 3.5.1962, *Hedge & Wendelbo W.2946* (W) - Kabul-Aliabad, 7.6.1950, *Neubauer 594* (W) - Sher Darwasa bei Kabul, 1840 m, 11.6.1951, *Gilli 1584* (W) - dto., 23.4.1970, *Podlech 17679* (G, M, Hb. PODL.) - 2 km E Flughafen Kabul, 1850 m, 29.4.1970, *Podlech 17727* (G, M, Hb. PODL.) - 30 km E Kabul an der Straße nach Jalalabad, 1750 m, 20.5.1969, *BRECKLE 1803a* (Hb. PODL.) - 2-15 km W Sarobi, 1000-1300 m, 13.5.1967, *Rechinger 34411* (W) - Sarobi, 12.5.1951, *Volk 1898* (W, Hb. PODL.) - dto., 10.4.1952, *Volk 2511, 2512* (W). -- Prov. Laghman: Woresmin Tangai (Schlucht des Kabul Flus-ses) 11 km oberhalb Shahidan, 780 m, 17.4.1977, *Podlech 28618* (Hb. PODL.) - Shahidan, 710 m, 17.4.1977, *Podlech 28675* (G, M, Hb. PODL.). -- Prov. Kunar: Kunar Tal 5 km unterhalb Chawki, 670 m, 7.4.1970, *Podlech 20349* (G, M, Hb. PODL.) & 10.4.1978, *Podlech 30655*(M, Hb. PODL.). -- Prov. Nangahar: Darrah-i-Nur bei Ql. Shahi, 870 m, 3.4. 1970, *Podlech 17388* (M, Hb. PODL.) - Kunar Tal 7 km E Shewa, 630 m, 6.4.1971, *Podlech 20216* (M, Hb. PODL.) - 13 km SE Jalalabad nahe der Straße nach Torkham, 550 m, 17. 4.1977, *Podlech 28627* (G, M, Hb. PODL.) & *28656* (M, Hb. PODL.) - 5 km SSW Ghaziabad, 570 m, 19.4.1977, *Podlech 28814* (Hb. PODL.). -- Prov. Logar: Pilalam, 15.6.1937, *Koelz 11878* (W) - Logar Tal, Dasht-e-Sakawa, 23.5.1971, *Volk 71/5a* (Hb. PODL.). -- Prov. Paktia: W Khost, 1200 m, 13.5.1972, *Anders 9002* (G, Hb. PODL.) - auf halbem Weg zwischen Khost und Yaqubi, 1150 m, 9.5.1970, *Anders 3551* (Hb. PODL.). -- Prov. Farah: 17 km S Adraskan an der Straße nach Delaram, bei der Abzweigung nach Shindand, 1300 m, 25.4.1977, *Podlech & Jarmal 29101* (Hb. PODL.) - Jija [= Shindand], 1200 m, 10.4.1949, *Koeie 4301, 4303* (W) - 10 miles S Shindand, 23.4.1964, *Furse 5479* (K) - Kareze Jan Mohammad an der Straße von Anardara nach Shindand, 1170 m, 25.4.1977, *Podlech & Jarmal 29171* (M, Hb. PODL.) - Jamal Ghazi, 35 km N Anardara an der Straße nach Shindand, 1070 m, 25.4.1977, *Podlech & Jarmal 29127*

(M, Hb. PODL.) - Sangbur, 15 km N Anardara, 840 m, 24.4. 1977, *Podlech & Jarmal 29102* (Hb. PODL.) - Farah Rud, 1150 m, 24.4.1967, *Rechinger 33417* (W) - Dashte Lashkari, 6 km W der Hauptstraße Delaram - Herat, an der Straße nach Farah, 780 m, 23.4.1977, *Podlech & Jarmal 29016* (M, Hb. PODL.) - inter Farah Rud et Dilaram, 1250 m, 24.4. 1967, *Rechinger 33483* (W) - Farah to Dilaram, 24.4.1964, *Furse 5546* (K) - 21 km NW Dilaram, 850 m, 24.4.1967, *Rechinger 33510* (W) - Dasht-e-Tele Kamand, 8 km S Qarya-e Til, 960 m, 20.4.1972, *Anders 8564* (G, Hb. PODL.) - Gulestan Darrah bei Seyab, 1100 m, 20.4.1972, *Anders 8575* (Hb. PODL.). -- Prov. Helmand: Shor Ab, an der Straße von Girishk nach Dilaram, 1050 m, 20.4.1972, *Anders 8629* (G, Hb. PODL.) - 30 km N Mus'a Qala, 1350 m, 18.3.1969, *Frei-tag & BRECKLE 4566* (Hb. BRECKLE; Hb. PODL.) - Straßengabelung Girishk - Kandahar - Lashkargah, 870 m, 17.4.1978, *Podlech 30697* (Hb. PODL.) - 65 km SSE Hokumati Darweshan, 5 km NE Pay Banader im Helmand Tal, 660 m, 10.4.1970, *Lalande R.2405* (Hb. PODL.) - 1 km E Kotale Shebyan, N' Hänge des Shebyan Ghar, Südgrenze Afghanistans, 1375 m, 12.4.1970, *Lalande R.2425* (Hb. PODL.). -- Prov. Orozgan: 20-25 km S Tirin, versus Kandahar, 1800 m, 23.5.1967, *Rechinger 35084, 35121* (W). -- Prov. Kandahar: an der Straße Girishk - Kandahar, 7 km E der Abzweigung nach Lashkargah, 900 m, 17.4.1978, *Podlech 30730* (Hb. PODL.) - dto., 10 km E der Abzweigung nach Lashkargah, 21.4.1972, *Anders 8665* (Hb. PODL.) - 44 km NE Qala Bist, 900 m, 21. 5.1967, *Rechinger 34793, 34794* (W) - 13 km E Keshkenakhud an der Straße nach Kandahar, 980 m, 17.4.1978, *Podlech 30686* (Hb. PODL.) - 24 km E Keshkenakhud, 22.4.1977, *Podlech & Jarmal 28901* (G, M, Hb. PODL.) - Nurmohammad-khan, 24 km W Kandahar, 975 m, 22.4.1977, *Podlech & Jarmal 28884* (M, Hb. PODL.) - Argandeh Brücke, 15 km W Kandahar, 990 m, 22.4.1977, *Podlech & Jarmal 28864* (Hb. PODL.) - 43 km N Kandahar versus lacum artificiale 'Arghandab reservoire', 1100-1200 m, 22.5.1967, *Rechinger 34898* (W) - N Kandahar, 29.4.1935, *Kerstan 362* (W) - Pir-zada near Kandahar, 15.5.1949, *Koeie 2018* (W) - Dschamal Baba S Kandahar, 1000 m, 27.2.1951, *Gilli 1600* (W) - 20 km S Kandahar, 27.5.1967, *Rechinger 35268* (W) - S'Hänge des Sadergi Ghar, 1160-1600 m, 22.4.1972, *Anders 8771* (Hb. PODL.) - 2 km NW Spin Boldak, 1200 m, 21.4.1972, *Anders 8702, 8713* (Hb. PODL.). -- Prov. Zabul: 40 km NE Qalat on road to Kabul, 1700 m, *Kukkonen 6012* (H).

Pakistan. Chitral: Gasin, 9300', *Bowes Lyon 937* (BM). -- Peshawar: inter Attock et Kushalgarh, 500 m, 30.5. 1965, *Rechinger 30402* (W). -- Rawalpindi: above Wah, 3.4.1973, *Townsend 73/320* (P). -- N. Waziristan: Teh Miram-shah, Memory of Shaheed, 12.5.1973, *Kazmi 4456* (M). -- Kohat: in jugo Kohat, 700-900 m, 26.5.1965, *Rechinger 30150* (W). -- Zhob: 26 km N Fort Sandeman versus Wana, inter Zhob et Sambaza, 1500 m, 20.5.1965, *Rechinger 29823* (W) & *Kazmi 1921* (M) - Fort Sandeman, 5.5.1897, *Harsukh 20501* (K). -- Quetta: inter Qila Abdullah et Sheila Bagh, 1600-1900 m, 8.5.1965, *Rechinger 29023* (W) - Pishin, 21. 5.1969, *Zaffar Ali 5596* (K) - Yaro prope Bostan, 1450 m, 8.5.1965, *Rechinger 28960* (W) & *Lamond 1011* (G) & *Kazmi 1450* (M) - Quetta, 30.5.1956, *Dick-Peddie 116* (K). -- Loralai: Mekhtar, 1500 m, 18.5.1965, *Rechinger 29785* (W) - inter Loralai et Sanjawi, 1500-1600 m, 14.5.1965, *Rechinger 29428* (W) - Loralai, 14.5.1965, *Rechinger 29409* (W) - Gumbaz, 16.5.1965, *Rechinger 29631* (W). -- Sibi: in jugo W Ziarat, 2200 m, 12.5.1965, *Rechinger 29283* (W) - 8 km NW Harnaj, 15.5.1965, *Rechinger 29533* (W) & *Kazmi 1748* (M). -- Chagai: inter Nushki et Quetta, 1200 m, 30.3. 1965, *Rechinger 27331* (W). -- Kharan: Nag, 21.4.1965, *Rechinger 28251* (W) - 70 km NE Panjgur, 1100 m, 21.4.1965, *Rechinger 28231, 28232* (W) - Basima prope Jangal, 1350 m, 21.4.1965, *Rechinger 28307* (W) & *Kazmi 1276* (M) - Jangal, 1500 m, 31.5.1963, *Popov 220* (BM). -- Makran: Panjgur, 1000 m, 20.4.1965, *Rechinger 28173, 28174, 28231* (W) - 60 km S Panjgur, 19.4.1965, *Rechinger 28100 pp.* (W) - inter Pasni et Kappar, 14.4.1965, *Rechinger 27890d* (W) - 30-50 km NE Panjgur versus Nag, 1100 m, 21.4.1965, *Rechinger 28201* (W) - 8-25 km W Awaran versus Turbat, 11.4.1965, *Rechinger 27714 pp.* (W). -- Kalat: infra jugum Bolan, 1500 m, 6.5.1965, *Rechinger 28796* (W) - inter Kolpur et Mach, 900 m, 23.4.1965, *Rechinger 28452* (W) - 69 km a Kalat versus Khuzdar, 1700 m, 1.4.1965, *Rechinger 27365* (W) - inter Surab et Kalat, 1700-1800 m, 22.4.1965, *Rechinger 28335* (W). -- Nicht genau lokalisierbar: Panjab, 1000', Hooker fil. & Thomson (G, P, W).

India. Punjab: Bari Duab, 60 miles NE Lahore, III.1857, *Schlagintweit 10656* (G).

Remarks:

Astragalus tribuloides is a very variable species but in all essential characters it is uniform and easily to recognize. The most variable characters are the length of the peduncle, the length of the flowers and the pilosity mainly of the pods. As most of the different characters occur very often in one population they are not considered as important for separating taxa.

In the central part of the distribution area we can find plants with abnormal big flowers, which are up to 20 mm long. Also length of calyx (up to 9 mm long) and the length of the stipules (up to 7 mm long) are correlated.
These plants can be separated as

21.a. Astragalus tribuloides var. thapsacenus Handel-Mazzetti (see under synonyms of the species).

Stipules up to 7 mm long. Flowers much bigger with calyx 7-9 mm long and standard 13-20 mm long.

Specimens seen:

Israel. Occupied territories: Judaean desert, 22-23 km from Jerusalem on Jericho road, 28.2.1935, *Eig & al.* (Hb. PODL.) - Khan Khadr, 23.5.1908, *Meyers & Dinsmore 4501* (B).

Jordan. 20 km SE Mafraq, along the road to H-5, 9.4. 1974, *Boulos & al. 6718* (G) - Wadi Ram, 3000', 13.4.1945, *Davis 8980, 9272* (K).

Saudi Arabia. N'Hijaz, Eden valley, Jebel Ash Shati Range, 30 km NE Ash Sharmah, 4000', 26.2.1979, *Collenette 866* (K).

Libanon. Baalbeck, 23.4.1933, *Mouterde 2103* (G).

Syria. E Aleppo, 17.4.1986, *Mouterde 5074* (G) - inter Aleppo et flum. Euphrat, Djib el Safa, 375 m, 22.4.1933, *Samuelsson 3792* (K) - Forkloss, near Homs, 650 m, 16.4. 1933, *Samulesson 3401* (K) - entre Palmyre et Homs, IV. 1911, *Haradjian 4062* (G) - desertum palmyrense, Djebel el Abiabad 15 km NE Ain el Beida, 500 m, 18.4.1933, *Samuels-son 3592* (K) - Palmyra, 16.4.1933, *Samuelsson 3411* (K) - dto., IV.1944, *Mouterde 8054* (G) - dto., 11.3.1952, *Pabot* (G) - dto., 16.4.1965, *Doppelbaur 126* (M) - entre Palmyre et Arak, 2.4.1955, *Pabot* (G) - Wadi W d'Arak, 2.5.1956, *Pabot* (G) - Qaryatein, 23.4.1935, *Mouterde 3813* (G) - dto., 25.4.1935, *Eig 3982* (G) - dto., 12.4.1943, *Davis 5709* (K) - S Qaryatein, 8.5.1953, *Pabot* (G) - Kissoué, 2.4.1953, *Pabot* (G) - S Kissoué, 20.4.1965, *Doppelbaur 396* (M) - Dmeir, 1.4.1952, *Pabot* (G) - Jabal Dmeir, 11.4. 1953, *Mouterde 10641* (G) - Deir el Hajar (SE Damas), 1.4. 1956, *Pabot* (G) - Umgebung von Damaskus, W Maalula, 19.4. 1965, *Doppelbaur 304* (M) - Damas, Doumma, 22.4.1896, *Pey-ron* (P) - Qalca er-Rahba, 45 km SE Dair-az-Zor, 14.3. 1979, *Licht* (B) - inter Meskene et Der es Sor, prope Herera, 26.3.1910, *Handel-Mazzetti 418* (B, W).

Iraq. FUJ: Hadhr, 7.4.1965, *Rawi & Hamada 33656* (K). -- DLJ: Raisha hill near Shbaichan, 78 km S Sinjar, 3.4. 1962, *Chakravarty & al. 32068* (K) - 70 km NW Falluja, 7.4.1961, *Chakravarty & al. 30358* (K). -- DWD: Almasad, 15 km S Rutba, 1.4.1964, *Chakravarty & al. 32853* (K).

Iran. Prov. Gilan: inter Rescht et Teheran prope Pat-schinar, 12.4.1902, *Bornmüller 6717* (B).

22. Astragalus triradiatus Bunge in Mém. Acad. Imp. Sci. St. Pétersb. 11,16: 10. 1868 in clave et l.c. 15,1: 7, 1869 cum descriptione ≡ *Tragacantha triradiata* (Bunge)O.Kuntze, Revis. Gen: 948. 1891. **Syntypes:** in agris prope Aleppo, *Rousseau* in hb. DECANDOLLE: *Aucher-Eloy 1302* (BM!, G-BOIS!); prope Aleppum, *Kotschy 52* (P!); Scheilan prope Aleppo, *Haussknecht 27* (G-BOIS!, P!). **Lectotype** (here designated): Scheilan prope Aleppo, 2.6.1865, *Haussknecht 27* (P!; Iso: G-BOIS!).

Plants annual, branched from the base, covered with 0,5-1,2 mm long white, at the nodes and in the inflorescences also with black hairs. Stems 6-20 cm long or sometimes nearly absent, prostrate to ascending, loosely to densely covered with semipatent to patent hairs. Stipules green, 4-5 mm long, narrowly triangular acuminate, adnate to the petiole ca, 1 mm long, connected behind the stem into a short sheath, white and black hairy. Leaves 2,5-6 cm long; petiole 0,5-1,5 cm long, like the rachis covered with subadpressed to semipatent hairs. Leaflets 5-7 (-9) paired, 4-10 mm long and 1,5-4 mm broad, narrowly elliptic so narrowly ovate, obtuse or slightly retuse at the apex, on both sides adpressed to subadpressed pilose. Inflorescences with a peduncle 1-5 cm long, covered with semipatent white and toward the top with increasingly black hairs, with 3-6 flowers in a dense head. Bracts membraneous, 1,5-2,5 mm long, triangular, acute, with subappressed white and black hairs. Calyx 5-6 mm long, campanulate, adpressed white and black hairy, toward the teeth with longer and more patent hairs; teeth subulate, 1,3-2,3 mm long, shorter than the tube, the 2 upper somewhat longer than the 3 lower. Corolla violet. Standard 8-11 mm long, ca. 3,5 mm broad, narrowly elliptic, slightly retuse at the apex. Wings 6-7,5 mm long, the limb narrowly oblong, rounded or erose at the apex, 2,5-4,5 mm long and 1-2 mm broad; auricle ca. 0,5 mm long, claw 3-3,5 mm long. Keel 4,5-5 mm long, the limb triangular-obovate, acute, 1,5-2 mm long and 1-1,5 mm broad, with lower edge strongly rounded and upper edge slightly curved; auricule very short, claw ca. 3 mm long. Staminal tube ending in a curved line. Legumes sessile, ± erect, narrowly ovate, rounded at the base, long tapering at the apex, 15-23 mm long, 4,5-5 mm high and 4-4.5 mm broad, carinate on the ventral side, deeply grooved on the dorsal side, covered with a double indumentum, with 0,1-0,4 mm long semipatent to patent hairs und with much longer, semipatent 1,3-2 mm long hairs, the latter sometimes with a tuberculate base and recurved apex. Pods opening at the ventral suture, fully bilocular. Seeds ca. 7 in each locule, 2-3 mm long and 1,5-2 mm broad, brown, smooth.
Flowering time: III-V. **Occurance:** in semidesert plains.
Distribution: Turkey, Lebanon, Syria, Iraq. Map 19 (p. 138).

Specimens seen:

Turkey. Prov. Amasiya: Tschengelhan, 500 m, V.1889, *Bornmüller 109a* (B). -- Prov. Marash: Marash, *Balls 904* (BM). -- Prov. Gaziantep: Yonas près de l'Euphrate, E Aintab [= Gaziantep], 25.4.1908, *Haradjian 1778* (K).

Lebanon. Zahlé, 6.4.1930, *Gombault 1349* (P).

Syria. Aleppo, *Aucher 1302* (BM, P) - dto., V.1841, *Kotschy 52* (P) - dto., 6.4.1928, *Gombault 329* (P) - dto., 18.4.1936, *Mouterde 4789, 5120* (G, HUJ) - Scheilan prope Aleppo, 2..4.1865, *Haussknecht 27* (G-BOIS, P) - Telejin to Abudhur, 5.3.1931, *Zohary* (HUJ) - inter Aleppo et flu-men Euphrat, Um el Ahmed, 275 m, 22.4.1933, *Samuelsson 3779* (K) - Antilibanon, Ouadi el Harir, 15.5.1892, *Peyron 5612* (P) - dto., 1300 m, 3.5.1933, *Samuelsson 4233* (K) - Souk Ouadi Barada [NW Damascus], 9.4. et 1.5.1933, *Gom-bault* (G, P, Hb. PODL.) - Bosrah, IV.1886, *Post* (BM).

Iraq. Amadiya District (MAM) (?): in deserto fl. Cha-bur [= Khabur], V.1867, *Haussknecht* (BM, G-BOIS). -- Persian Foothill District (FPF): Pilkana, 10 km E Khana-qin, 220 m, 3.4.1950, *Rawi 12622* (K).

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Revision of Astragalus L. sect. Malacothrix Bunge (Leguminosae) in Iran

by A. A. MAASSOUMI

Abstract:
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A revision of the genus *Astragalus* L. sect. *Malacothrix* Bunge in Iran including sect. *Heterozyx* Bunge and sect. *Bornmuelleriana* Sirj. & Rech.f. with 70 species is presented. The section is divided in 3 subsections and 29 informal groups. 12 species are described as new and 9 species are transferred from other sections to sect. *Malacothrix*. The types of all taxa and the investigated material are indicated, keys to the groups and species are given as well as distribution maps and flower dissections.

1. Introduction

The present work is the result of a longterm study of the genus *Astragalus* in Iran. During identification of the rich material in the big herbaria of Iran it became clear that the section *Malacothrix* is one of the larger and most complex groups of the genus in our country. It has reached a higher evolutionary level within the genus like sect. *Caprini* and contains a great number of species, some of them undescribed. There is no valuable treatment of this group as a whole available at present. Therefore the revisional study of the sect. *Malacothrix* was the main focal point of my work on the genus for the last five years.

In the present treatment all the species are grouped according to their natural affinities. There are some complex species groups as well as some more isolated species. To these groups I don't want to give any formal taxonomic rank, therefore no latin description is given for them.

2. Material and Methods

This investigation of the sect. *Malacothrix* is based on the rich material of the two big herbaria in Tehran (TARI and EVIN), but the material of the following and mostly newly established herbaria was also consulted:

Herbarium of the Faculty of Science (Tehran)
Herbarium of the Faculty of Agriculture (Mashhad)
Herbarium of the Faculty of Science (Esfahan)
Herbarium of the Faculty of Agriculture of Technical University (Esfahan)
Herbarium of the Faculty of Science (Uroumieh)
Herbarium of the Faculty of Agriculture (Azarbayejan)
Herbarium of the Faculty of Pharmacy (Tehran)
Herbarium of the Research Center of Esfahan.

For the verification of the named material I had the opportunity to examine the type specimens of most of the older species borrowed by Prof. Dr. D. PODLECH, Munich, from several European herbaria i.e.: B, G, G-BOIS, GOET, H, JE, K, LE, P, PR, W, WU.

I am grateful to Prof. PODLECH for his advice and discussion on different aspects of my work. I want to thank all the herbaria curators for their kind collaboration and for sending the valuable material. I wish to express my best thanks to my colleagues Mr. A. ASSADI and Mr. V. MOZAFFARIAN for their collaboration in collecting interesting plant material. Without their help this work would never have been realized.

3. Taxonomic position of sect. Malacothrix Bunge within the genus

The sect. *Malacothrix* was placed by BUNGE (1868) into his subgenus *Hypoglottis* together with seven other big or small sections.This subgenus was mainly based on the morphological character of dense capitate or spikelike inflorescences. In recent systems (PODLECH 1982) this subgenus is no longer uphold because of nearly continuous transitions to other groups of the genus. The sections within this former subgenus in which the sect. *Malacothrix* has a central position are also not clearly defined. So it is not surprising, that some species must be transferred into other sections. Different peripheric species of sect. *Malacothrix* have some connections with other related sections:

1. The groups *A. pulchellus*, *A. senilis* and *A. inexpectatus* are allied to sect. *Dasyphyllium* by their contiguous leaflets.
2. The group *A. plebejus* and subsect. *Bornmuelleriana* show some connections to sect. *Stereothrix* by the setaceous calyx teeth.

Species transferred to or from Sect. Malacothrix:

Transfered species	from section	to section
A. hirtus	*Stereothrix*	*Malacothrix*
A. saccatus	*Grammocalyx*	*Malacothrix*
A. aspadanus	*Grammocalyx*	*Malacothrix*
A. inexspectatus	*Dasyphyllium*	*Malacothrix*
A. deickianus	*Dasyphyllium*	*Malacothrix*
A. atricapillus	*Malacothrix*	*Hypoglottidei*

4. Taxonomical characters

The following characters are of taxonomic importance for the definition of the section and the delimitation of the species within the section:

1. Indument:

We can find appressed hairs, subpatent hairs and spreading hairs. In these cases the plants are covered with a uniform indument. Sometimes different parts of the plants as stems, petiole, rachis and peduncle are covered with a double indument such as appressed hairs mixed with subpatent or spreading hairs or on the pod long lanate hairs mixed with shorter black or white spreading hairs. In some groups we can find hairs which are inserted in little tubercles, e.g. *A. hirtus* Bunge and *A. capillatus* Maass. with quadrangular tubercles in the vegetative parts and *A. pulchellus* Boiss. and *A. deickianus* with spherical tubercles on the pods.

2. Habitat:

The ecological adaptationt to different habitats like high mountain or lowland areas are of great value. This is mostly connected with the general appearance of the plants, this i.e. size of the plants, the simple or divided caudex and others.

3. Stem:

The plants are acaulescent or the stems are well developed and either erect or prostrate or ascending. The kind of indument, the length of hairs and if the hairs are patent or appressed is of great taxonomic value.

4. Stipules:

All stipules are more or less adnate to the petiole at the base and jointed to each other behind the stem at different length. The length of adnation to the petiole is a useful character for separating related taxa.

5. Leaves:

The length of leaves and especially of the petiole are important characters. Species without petiole, e.g. A. laristanicus are easily distinguishable from those with a distinct petiole. The type of hairs in petiole and rachis are of great importance. We can find species with a simple indument of appressed or spreading hairs but also with double indument of long spreading and short appressed hairs.

6. Leaflets:

Size and shape of the leaflets are reliable characters. They may be remote to contiguous. The leaflets are glabrous above or hairy on both sides. The hairs are spreading or appressed.

7. Inflorescences:

The inflorescences are mostly dense at least at the beginning of anthesis, capitate or spikelike, with few to numerous nearly sessile to shortly pedicelled flowers, sometimes elongated when fruiting. They are shortly to long peduncled, the peduncle sometimes declined. These characters are of high taxonomic value.

8. Bracts:

Length, shape and indument of bracts are sometimes useful characters for separating taxa.

9. Calyx:

The shape, length, colour and indument of the calyx are important. Mostly the calyx is tubular, sometimes it is slighly to distinctly inflated, but in all cases it is ruptured by the ripe pod. The length of calyx teeth in relation to the tube is mostly a constant character. It varies from very short to somewhat longer than the tube.

10. Corolla:

The corolla is always glabrous and varies in colour. Some species have violet or purplish corolla and if carefully dried the colour will not change. Species with white corolla change mostly after drying into pale blue or violet, e.g. A. tenuiscapus. Plants with yellow corolla change the colour after drying often into dirty yellow or pale purplish but others remain yellow in the dried state. A. podocarpus has always a lemon yellow corolla.

11. Standard:

The shape of standard is a useful character. Five different types of standard shape are recognized:

1. Rhomboid standard with ligulate attenuate apex:
A great number of species have this kind of standard. The apex may be emarginate or deeply incised or bilobate (e.g. *A. eugenii* Grossh.) or acute (e.g. *A. indomitus* Mass.).
2. Rhomboid standard with short or nearly absent ligulate appendix:
In this case the general shape of the standard is rhomboid but the apex is very shortly attenuate (e.g. *A. mollis* M.Bieb., *A. chrysotrichus* Boiss. and *A. belgheisicus* Mass.).
3. Rhomboid-ovate standard:
In this case the shape is intermediate between ovate and rhomboid. The apex is in no way attenuate and nearly as broad as the middle parts. Only few species belong to this group (e.g. *A. pauperiflorus* Bornm., *A. tenuiscapus* Freyn & Bornm. and *A. melanodon* Boiss.)
4. Elliptic standard:
Only few species belong here (e.g. *A. termeanus* Maass. & Podlech and *A. laristanicus* Bornm. & Gauba).
5. Obovate standard:
In this case the apical part of standard is broader the the middle part (e.g. *A. iranicus*).

12. Wing-petals:

With few exceptions the general shape of wing-petals is not very useful for separating taxa. In some cases the dilatation of the limb towards the apex clearly define a species against its relatives, e.g. *A. mollis* M.Bieb against *A. takhtadzhani* Grossh. and *A. suluklensis* Freyn. In few species the limb is incised or asymmetrically notched at the apex.

13. Keel:

Although there are two different shapes of limb such as triangular and oblique-elliptic, this character was never used for separating taxa.

14. Pods:

Size and shape of the pods are useful characters. The Astragalus plebejus group for example has always remarkably small pods of 5-6 mm length. Several species have pods with a ± long stipe such as *A. podocarpus* C.A.Mey., *A. macrostachys* DC. and *A. eriocarpus* Boiss. but most have sessile pods. The apex may be straight or is ending into a recurved beak.

5. Taxonomic treatment of the section

Astragalus L. sect. **Malacothrix** Bunge in Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 54. 1868. Lectotypus: *A. mollis* M.Bieb. (PODLECH in Mitt. Bot. Staatss. München 29: 481. 1990).
= Sect. *Heterozyx* Bunge in Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 53. 1868 Lectotypus *A. heterodoxus* Bunge (PODLECH in Mitt. Bot. Staatss. München 29: 477. 1990.
= Sect. *Bornmuelleriana* Sirj. in Repert. Spec. Nov. Regni Veg. 52: 15. 1943.Lectotypus: A. anserinaefolius Boiss. (PODLECH in Mitt. Bot. Staatss. München 29: 466. 1990.

Plants perennial, acaulescent or caulescent. Stipules adnate to the petiole and jointed behind the stem to each other. Leaves imparipinnate, nearly sessile or with a distinct petiole; petiole and rachis densely covered with appressed or spreading white hairs, or mixed with black hairs. Leaflets opposite, alternate or very rarely verticillate. Inflorescences axillary or subterminal, with a short or long peduncle, densely capitate or oblong-elliptic or cylindric, forming a dense or loose spike. Bracts linear to narrowly triangular. Bracteoles absent. Flowers very shortly pedicelled. Calyx tubular, somewhat gibbous at the base, rarely inflated, but always ruptured by the pod, covered with white hairs or sometimes mixed with black hairs, the teeth narrowly triangular or setaceous, much shorter up to equaling the tube. Corolla glabrous, white, yellow or violet. Standard rhomboid with rounded apex or with a narrow ligulate appendix, or ovate-elliptic or obovate. Wing petals shorter than standard, the limb rounded at apex or rarely obliquely notched, auriculate at the base. Keel limb triangular or oblique-elliptic. Ovary pilose, sessile or stipitate. Pods ovoid or ellipsoid, sessile or stipitate, densely covered with lanate hairs or sometimes with mixed black and white, short spreading hairs, mostly fully bilocular.

6. Key to the groups

1	Leaflets verticillate (partly)	Group *Heterodoxus*
-	Leaflets opposite or alternate	2
2	Limb of wing-petals retuse or emarginate dentate at apex	3
-	Limb of wing-petals rounded at apex	4
3	Limb of wing-petals retuse or tridentate at apex	Group *Pauperiflorus*
-	Limb of wing-petals asymetrically emarginate at apex	Group *Galbineus*
4	Leaflets linear or narrowly elliptic	5
-	Leaflets ovate, elliptic or obovate	8
5	Plants stemless	6
-	Plants with developed stem	7
6	Standard ovate-oblong, flowers yellow	Group *Glochidiatus*
-	Standard rhomboid, flowers purplish	Group *Indomitus*
7	Standard obovate or orbicular, flowers yellow	Group *Podocarpus*
-	Standard rhomboid, flowers dark violet	Group *Macrostachys*
8	Calyx teeth equaling the tube or slightly longer	9
-	Calyx teeth 1/2 - 1/5 the lenght of tube	10
9	Calyx ca. 10 mm long, flowers yellow	Group *Plebejus*
-	Calyx ca. 15 mm long, flowers lilac or violet	Group *Anserinaefolius*
10	Leaflets densely covered with spreading or appressed hairs on both sides	11
-	Leaflets glabrous on upper side	12
11	Hairs inserted in little tubercles	Group *Hirtus*
-	Hairs without tubercles	14

12 Flowers violet. Standard rhomboid, strongly ligulate-attenuate toward the apex Group *Holopsilus*
- Flowers yellow. Standard rhomboid, not ligulate-attenuate toward the apex 13
13 Stipules densely covered with black and white or only with white hairs Group *Mollis*
- Stipules glabrous or ciliate at the margin, strongly rugose at the base Group *Daghdaghabadensis*
14 Standard rhomboid in outline 15
- Standard ovate-oblong, obovate or orbicular 24
15 Plants with developed stem, stem ca. 20-30 cm long Group *Eriopodus*
- Plants with short stem ca. 5-10 cm or stemless 16
16 Inflorescence capitate or umbellate 17
- Inflorescence conical or cylindric 22
17 Peduncle thick. Bracts ca. 8-10 mm, distinctly longer than the pedicel Group *Canosus*
- Peduncle thin. Bracts ca. 2-5 mm, distinctly shorter than the pedicel 18
18 Leaflets remote 19
- Leaflets contiguous, complicate 20
19 Standard rhomboid, ligulate-attenuate toward the apex Group *Holosemius*
- Standard rhomboid in outline, not attenuate toward the apex Group *Melanodon*
20 Pods ovoid, densely lanate, sessile Group *Inexpectatus*
- Pods ellipsoid, strongly attenuate toward the apex, stipitate, covered with hairs inserted in little tubercles 21
21 Leaflets complicate Group *Senilis*
- Leaflets not as above Group *Pulchellus*
22 Standard rhomboid, strongly attenuate toward the apex, plants stemless, stipules rugose at the base Group *Macrourus*
- Standard rhomboid, not ligulate-attenuate toward the apex, plant ± with short or long stem 23
23 Flowers yellow. Pods ellipsoid Group *Chrysotrichus*
- Flowers dark violet. Pods ovate Group *Rawlinsianus*
24 Leaflets densely covered with appressed hairs 25
- Leaflets densely covered with spreading hairs 27
25 Leaflets glabrous above, plant covered with very short hairs Group *Idoneus*
- Leaflets hairy on both sides, plant covered with long hairs 26
26 Plants caulescent, inflorescence elongate Group *Spachianus*
- Plants acaulescent, inflorescence umbellate Group *Patrius*
27 Petiole and rachis covered with long and short, spreading hairs Group *Iranicus*
- Petiole and rachis covered with long spreading hairs only 28
28 Leaflets covered with scattered hairs on upper side. Pods stipitate Group *Rivashensis*
- Leaflets densely covered on both sides. Pods sessile Group *Hendelanicus*

7. Key to species

1 Leaflets verticillate *A. heterodoxus*
- Leaflets alternate or opposite 2
2 Plants caulescent, stem up to 20 cm long 3
- Plants acaulescent or shortly caulescent, stem 10 cm long 11
3 Flowers yellow 4
- Flowers purplish or violet 5
4 Standard limb obovate. Leaflets linear *A. podocarpus*
- Standard limb rhomboid. Leaflets oblong-elliptic *A. chrysotrichus*
5 Leaflets linear *A. macrostachys*

- Leaflets ovate-elliptic or obovate 6
6 Calyx teeth setaceous, much longer than tube 7
- Calyx teeth subulate, shorter than tube 8
7 Calyx ca. 8-10 mm long. Leaves 2-4 cm long *A. anserinaefolius*
- Calyx ca. 14-18 mm long. Leaves 5-9 cm long *A. laristanicus*
8 Ovary stipitate. Leaflets covered with long spreading hairs 9
- Ovary sessile. Leaflets glabrous or with some scattered hairs on lower side 10
9 Bracts 10-12 mm. Wing-petals round-tipped, the limb as long as claw *A. eriopodus*
- Bracts 5 mm. Wing-petals asymmetrically notched or emarginate at the tip, the limb 1/2 as long as claw *A. vessalae*
10 Leaflets completely glabrous. Petiole ca. 5 mm long *A. holopsilus*
- Leaflets covered with short appressed hairs on lower side. Petiole ca. 2-4 (-5) cm long *A. lippertii*
11 Calyx teeth setaceous, as long as or slightly longer than tube 12
- Calyx teeth subulate or setaceous, 2-5 times shorter than tube 18
12 Small plants. Leaflets 4-7 pairs 13
- Not as above 15
13 Plants acaulescent. Calyx tube campanulate. Pods ca. 15 mm long *A. plebejus*
- Plants shortly caulescent. Calyx tube tubular. Pods ca. 7-8 mm long 14
14 Petiole equaling the limb, densely covered with appressed hairs *A. babakhanloui*
- Petiole much longer than the limb, densely covered with spreading hairs *A. chahartaghensis*
15 Calyx 8-10 mm long, leaflets complicate *A. anserinaefolius*
- Calyx 13-18 mm long 16
16 Stipules free from one another *A. ghahremanii*
- Stipules jointed to one another 17
17 Stipules 4-5 mm long, at a length of ca. 1 mm adnate to the petiole *A. termeanus*
- Stipules 8 mm long, at a length of ca. 2 mm adnate to the petiole *A. laristanicus*
18 Leaflets covered with long rigid hairs inserted on tubercles 19
- Leaflets densely covered with long or short, appressed or spreading hairs 20
19 Leaflets 8 pairs, densely covered with long, rigid hairs up to 4-4,5 mm long, inserted on rectangular tubercles *A. hirtus*
- Not as above *A. capillatus*
20 Standard limb oblong-elliptic, ovate or obovate, not ligulate-attenuate toward the apex 21
- Standard limb rhomboid, ± ligulate-attenuate toward the apex 37
21 Bracts ovate triangular, 2-4 (-5) mm long, densely covered with black hairs 22
- Bracts triangular-linear, 7-20 mm long, ± with black and white hairs 32
22 Leaflets linear *A. glochidiatus*
- Leaflets oblong-elliptic, ovate or obovate 23
23 Limb of wing-petals emarginate at apex or retuse 24
- Limb of wing-petals rounded at apex 25
24 Calyx covered with short appressed hairs, the teeth subulate *A. pauperiflorus*
- Calyx covered with long spreading hairs, the teeth setaceous, ca. 3-4 mm long *A. ghortapacensis*
25 Petiole, rachis and peduncle densely covered with spreading hairs 26
- Petiole, rachis and peduncle densely covered with appressed or subpatent hairs 31
26 Inflorescence capitate, 7-10 flowers. Leaflets contiguous. Plants 5-7 cm tall 27
- Inflorescence cylindric, 12-30 flowers. Leaflets remote. Plant 15-35 cm tall 28
27 Stipules ovate, free from one another *A. tenuiscapus*
- Stipules lanceolate, long jointed to one another *A. expectatus*
28 Petiole covered with long and short patent hairs. Standard ca. 23 mm long.

	Pods sessile	*A. griseus*
-	Petiole covered densely with uniform spreading hairs	29
29	Pods sessile	*A. saccatus*
-	Pods stipitate, stipe ca. 2 mm long.	30
30	Calyx teeth setaceous, 5-7 mm long	*A. perdurabilis*
-	Calyx teeth subulate, 3-4 mm long	*A. rivashensis*
31	Inflorescence capitate with 4-7 flowers	*A. patrius*
-	Inflorescence elongate, cylindric with many flowers	32
32	Leaflets 9-10 pairs. Limb of wing-petals round-tipped	*A. spachianus*
-	Leaflets 13-15 pairs. Limb of wing-petals asymmetrically emarginate at the tip	*A. ghoortapacensis*
33	Leaflets ± glabrous or with scattered hairs on upper side	34
-	Leaflets densely hairy on both sides	35
34	Peduncle covered with short appressed hairs. Pods covered only with long hairs	*A. leushanensis*
-	Peduncle covered with short and long hairs. Pods with two kinds of hairs	*A. idoneus*
35	Leaflets densely covered with spreading hairs	*A. iranicus*
-	Leaflets densely covered with appressed or subappressed hairs	36
36	Petiole and rachis covered with uniform appressed hairs	*A. daghdaghabadensis*
-	Petiole and rachis covered with long and short subappressed hairs	*A. inoblitus*
37	Leaflets ± glabrous on upper side or with some scattered hairs toward the margin	38
-	Leaflets densely hairy on both sides	53
38	Peduncle, rachis and leaflets completely glabrous	*A. holopsilus*
-	Peduncle, rachis and lower side of leaflets ± hairy	39
39	Flowers yellow or greenish	40
-	Flowers purplish or violet	48
40	Rachis and peduncle covered with spreading hairs	41
-	Rachis and peduncle glabrous or with appressed hairs	45
41	Leaflets 16-20 pairs	42
-	Leaflets 7-12 pairs	43
42	Leaflets 18-20 pairs. Inflorescence elongate	*A. typhaeformis*
-	Leaflets ca. 16 pairs. Inflorescence a short spike	*A. caligineus*
43	Leaflets 7-8 pairs	*A. belgheisicus*
-	Leaflets 10-12 pairs	44
44	All hairs without tubercles	*A. mollis*
-	Hairs inserted in rectangular tubercles at the base	*A. capillatus*
45	Bracts shorter than calyx tube	*A. memnonius*
-	Bracts equaling or longer than calyx tube	46
46	Bracts 15-20 mm long	*A. takhtadzhani*
-	Bracts 7-10 (-12) mm long. Leaflets 8-13 (-16) pairs	47
47	Leaflets 12-13 (-16) pairs, oblong-elliptic. Standard emarginate	*A. alamouticus*
-	Leaflets 9-10 pairs, narrowly elliptic. Standard subacute	*A. indomitus*
48	Leaflets oblong, narrowly elliptic or linear	49
-	Leaflets obovate	52
49	Standard 16-20 (-21) long. Auricle of the wing ca. 2 mm long	50
-	Standard ca. 26 mm long. Auricle of the wing ca. 2,5 mm long	*A. birangae*
50	Flowers yellow. Leaflets covered with scattered hairs on upper side	*A. pseudomacrostachys*
-	Flower violet, leaflets glabrous above	51
51	Petiole and rachis covered with long and short hairs	*A. nahavandicus*
-	Petiole and rachis covered only with long hairs	*A. leucotrichus*
52	Leaflets 11-13 pairs	*A. lippertii*

- Leaflets 15-20 pairs *A. kabristanicus*
53 Inflorescence elongate, cylindric or sometimes spherical, with many flowers 54
- Inflorescence short ovate or dense capitate, flowers few 68
54 Flowers purplish or pale violet 55
- Flowers yellow or greenish 56
55 Calyx 8 mm long. Standard ca. 18 mm long *A. rawlinsianus*
- Calyx 18-22 mm long. Standard 20-24 mm long *A. suluklensis*
56 Limb of wing-petals slightly emarginate 57
- Limb of wing-petals rounded or acute at apex 58
57 Leaflets with appressed hairs. Calyx teeth ca. 5 mm long *A. galbineus*
- Leaflets with spreading hairs. Calyx teeth ca. 3 mm long *A. sarae*
58 Plant scapose, acaulescent. Stipules distinctly rugose at the base 59
- Plant with a short stem 1-7 cm long 62
59 Inflorescence spherical or ovate *A. holosemius*
- Inflorescence cylindric, (-3) 8-12 (-20) cm long 60
60 Leaflets densely covered with appressed hairs. Limb of wing-petals attenuated toward the apex *A. macrourus*
- Leaflets glaucous, densely covered with long villous hairs, Limb of wing-petals dilated toward the apex 61
61 Leaflets imbricate, narrowly ovate, acutely by tipped *A. elegans*
- Leaflets remote, ovate-oblong or elliptic, obtusely by tipped *A. eugenii*
62 Stipules glabrous *A. hendelanicus*
- Stipules hairy 63
63 Leaflets 10-15 pairs 64
- Leaflets 18-20 pairs *A. typhaeformis*
64 Leaflets glabrous above or with some scattered hairs only 65
- Leaflets hairy on both sides 66
65 Leaflets obovate or obcordate, upper side with scattered hairs *A. memnonius*
- Leaflets narrowly elliptic, upper side glabrous *A. khajiboulagensis*
66 Pods covered with long hairs only *A. canosus*
- Pods covered with long and short spreading hairs 67
67 Petiole covered with short appressed hairs mixed with some isolated long hairs *A. mollis*
- Petiole covered with short spreading hairs *A. pseudoantilibani*
68 Limb of wing-petals tridentate at apex *A. rudimentus*
- Limb of wing-petals rounded or acute at apex 69
69 Inflorescence umbellate with few flowers 70
- Inflorescence capitate or cylindric with many flowers 81
70 Peduncle densely covered with appressed hairs 71
- Peduncle densely covered with short spreading hairs 78
71 Flowers white. Bracts linear ca. 6-7 mm long. Calyx teeth 4-5 mm long *A. lisaricus*
- Flowers violet. Bracts ovate ca. 2-3 mm long 72
72 Leaflets contiguous, complicate 73
- Leaflets not as above 77
73 Pods stipitate 74
- Pods sessile 76
74 Petiole ca. 1-2 cm long, covered with short hairs 75
- Petiole ca. 5 cm long, covered with long hairs *A. senilis*
75 Petiole covered with appressed hairs *A. inclinatus*
- Petiole covered with spreading hairs *A. inexpectatus*
76 Leaflets 6-7 pairs, elliptic ovate, not imbricate *A. pulchellus*
- Leaflets 9-11 pairs, obovate or orbicular, imbricate *A. deickianus*
77 Calyx tube not inflated. Leaflets oblong-elliptic, tip rounded *A. beckii*

-	Calyx tube slightly inflated. Leaflets narrowly elliptic, acute	*A. aspadanus*
78	Calyx ca. 9 mm long	80
-	Calyx ca. 11-12 mm long	79
79	Flowers white. Petiole covered with spreading hairs	*A. tenuiscapus*
-	Flowers violet. Petiole with long and short subappressed hairs	*A. rusticus*
80	Pods sessile, densely lanate	*A. melanodon*
-	Pods stipitate	81
81	Plant with developed stem, ca. 7 cm long	*A. pseudopulchellus*
-	Plant acaulescent	*A. pulchellus*

I. Subsect. Dasyphylloides Maassoumi subsect. nov.

Plantae perennes acaules vel breviter caulescentes. Foliola imbricata, in statu juvenile complicata. Legumen manifeste stipitatum, apice rostratum. **Typus subsectionis:** *A. pulchellus* Boiss.

1. Astragalus senilis group

Plants acaulescent. Leaflets ovate to orbicular, complicate, imbricate. Flowers violet. Standar rhomboid. Pods inflated.
A. senilis

1. Astragalus senilis Bornm. in Bull. Herb. Boiss. sér. 2, 5: 755. 1905. **Type:** Inter Rascht et Kazwin in trajectus charsan, in summo montis 2000 m, *Bornmüller 6729* (B) (n.v.).

Fig.: MAASSOUMI, A.A., 1990, Illustr. guide gen. Astrag. Iran 1: plate 93. (habit); pages 217 (indument of peduncle and pods) and 222(flower dissection).

Plants acaulescent, 10-13 cm tall. Stipules 8-10 mm long, pilose, abruptly attenuate toward the apex, at the base adnate to the petiole and jointed to one another. Leaves ca. 11 cm long, petiole ca. 5 cm long, both petiole and rachis covered with scattered long hairs. Leaflets 12 pairs, contiguous, elliptic-oblong or obovate, ca. 10 mm long and 5 mm broad, pilose on both sides. Inflorescence a dense or loose spike, peduncle ca. 10 mm long, pilose. Flowers numerous with very short pedicels. Bracts linear, ca. 6 mm long, covered with black and white hairs. Calyx cylindric, ca. 12 mm long, vested with black and white hairs, the teeth subulate ca. 1-2 mm long. Corolla violet. Standard ca. 20 mm long, the limb rhomboid, constricted in the middle, ca. 9 mm broad, emarginate at apex. Wing-petals ca. 18 mm long, the limb narrowly elliptic, attenuate toward the apex, at the base auriculate, the limb slightly shorter than the claw. Keel ca. 16 mm long, the limb oblique-elliptic, slightly longer than the claw. Pods sessile, 20-23 mm long and 6 mm broad, terminating in slightly curved cuspidate beak ca. 4-5 mm long, carinate ventrally, sulcate dorsally, covered with long white bristle-like hairs, bilocular.

Specimens seen:

Tehran: Galanduak, Basti, 1780 m, 7.5.1974, *Sanii 11243* (TARI) - Road before Adaran, Arangeh mts., 1900 m, 13.5.1985, *Khatamsaz, Maassoumi & Abouhamzeh 52104* (TARI) - Nodehak, protected area, 1200 m, 12.5.1974, *Dini & Bazargan 8515* (TARI) - Zardband, 3.5.1974 (?, s.n.), Rudak, 2100 m, 7.11.1965, *Majda Zumer 233* (BG) - Touchal, Manzariyeh, 1800-2500 m, 8.4.1966, *Majda Zumer 493* (BG).

Ghazvin: Abb-e Garm, Asiab to Ilderejin, 1700-2200 m, *Maassoumi & Mirhosseini 59419* (TARI).

2. Astragalus inexpectatus group

Plants acaulescent. Leaflets oblong-elliptic, imbricate. Peduncle recurved, densely covered with short spreading or appressed hairs. Pods inflated or not.
Astragalus inexpectatus, A. expectatus, A. inclinatus.

2. Astragalus inexpectatus Maassoumi & Podlech in Iran. J. Bot. 4: 77. 1988. **Holotype:** Esfahan, Boin, Tang-e dozdan, Kuh-e Balashtad, 2700-2900 m, 20.7.1981, *Nowroozi & Etemadi* (TARI!; Iso: Hb. PODLECH!).

Fig.: MAASSOUMI, A.A., l.c.: 78. (habit); - pages 219 (indument of peduncle and pod) and 222 (flower dissection).

Plants densely hairy, acaulescent, or shortly caulescent, stem ca. 2 cm long. Stipules ca. 5-7 mm long, greenish, pilose or ciliate, narrowly triangular, at the base adnate to the petiole and jointed to one another. Leaves 5-8 cm long, petiole ca. 1-2 cm long, densely covered with short spreading hairs. Leaflets imbricate, complicate, 8-10 pairs, oblong-elliptic, ca. 6-12 mm long and 3-6 mm broad, both sides densely covered with short spreading hairs. Inflorescence solitary, capitate, peduncle ca. 5-6 cm long, densely covered with short appressed hairs. Flowers numerous. Bracts ca. 4 mm long, linear, with black and white hairs. Pedicel ca. 2-3 mm long, pilose. Calyx tubular, ca. 10 mm long. Corolla yellow becoming violet. Standard ca. 16 mm long, the limb rhomboid, ca. 8 mm broad, emarginate at apex. Wing petals ca. 15 mm long, the limb oblong, ca. 8 mm long, rounded at apex. Keel ca. 12 mm long, the limb oblique-elliptic, equaling the claw. Ovary pilose, sessile. Pods sessile, ca. 15 mm long and 6 mm broad, oblique-elliptic, terminating in a beak ca. 3 mm long, ventrally carinate, dorsally deeply sulcate, incompletely bilocular.

Note: This species has been transfered from Sect. *Dasyphyllium* to Sect. *Malacothrix*.

Specimen seen:

Esfahan: Boin, Tang-e Dozdan, Kuh-e Balashtad, 2700-2900 m, 20.7.1981, *Nowroozi & Etemadi 1287* (TARI).

3. Astragalus expectatus Maassoumi in Mitt. Bot. Staatss. München 29: 503. 1990. **Holotype:** Fars, 20 km from Nurabad to Korekan, Doshman-Ziary region (WP2), 1800 m, 31.5.1983, *Mozaffarian 45716* (TARI).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 65. (habit); - page 219 (indument of peduncle and pod).

Plants acaulescent, procumbent, ca. 8 cm tall. Stipules 4-6 mm long, lanceolate, pilose, at the base shortly adnate to the petiole and jointed to one another. Leaves ca. 2-3,5 cm long, petiole very short, ca. 5-7 mm long, both petiole and rachis densely covered with white spreading hairs. Leaflets 7-8 pairs, contiguous, oblong or narrowly elliptic, complicate, ca. 5-8 mm long and 3-4 mm broad, both sides densely covered with spreading hairs. Inflorescence solitary. Flowers numerous in dense head. Peduncle ca. 6 cm long, densely covered with white

spreading hairs, toward the inflorescence mixed with black hairs. Bracts lanceolate, acuminate, ca. 6 mm long, covered with black and white hairs. Corolla yellow, changed to dark violet. Calyx tubular, ca. 12 mm long, white lanate, the teeth linear, ca. 4-5 mm long, densely covered with black and white hairs. Ovary pilose, sessile. Pods ovoid, ca. 11 mm long, and 5 mm broad, at the base shortly attenuate, at the apex rostrate, curvate, ventrally applanate-carinate, dorsally rounded, sulcate, densely covered with long white hairs, mixed with short spreading hairs, fully bilocular.

Specimen seen:

Fars: 20 km from Nurabad to Kore kan, Doshaman-ziary region (WP2), 1800 m, 31.5.1983, *Mozaffarian 45716* (TARI).

4. Astragalus inclinatus Maassoumi, sp. nov.

Species similar to *A. inexpectatus* Maassoumi & Podlech but it differs from this in having short appressed hairs on vegetative parts; from *A. griseus* Boiss. it differs in having a rhomboid standard limb (not oblong-elliptic).

Holotypus: Esfahan: Konsar to Buin-Miandasht, Kuh-e Sangandaz, 18.6.1986, 2700-3100 m,Termeh, *Tehrani & Karavar s.n.* (EVIN).
Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 72. (habit); - plate 72 (habit); - pages 219 (indument of peduncle and pods) and 222 (flower dissection).

Plantae perennes, acaules, ca. 10 cm altae. Stipulae ovatae, triangulares, ca. 3-4 mm longae, appresse dense albi-nigri-pilosae, basi petiolo breviter adnatae, inter se connatae. Folia 4-5 cm longa, petiolo 7-10 mm longo, sicut rachis dense appresse piloso, foliola 11-12 juga, complicata, oblongi-elliptica ca. 8 mm longa et 3 mm lata, utrimque appresse pilosa. Inflorescentia solitaris, subcapitata, pedunculo 6,5-7 cm longo, dense brevissime appresse piloso suufulta. Bracteae subulatae ca. 3 mm longae, patenter albi-nigri-pilosae. Calyx tubulosus, ca. 13 mm longus, distincte inflatus longitudinaliter atropurpurei-nervosus, albi-nigri-pilosus, dentibus linearibus ca. 3 mm longis. Corolla flava, demum violacea. Vexillum ca. 20 mm longum, lamina rhomboida, apicem versus ligulata, antice emarginata vel biloba. Alae ca. 16 mm longae, lamina anguste elliptica, antice rotundata, basi auricula ca. 1 mm longa provisa, ungue laminam aequante. Carina ca. 15 mm longa, lamina oblique elliptica. Ovarium pilosum, breviter stipitatum. Legumen elipsoideum, ca. 12 mm longum et 4 mm latum, apice rostratum, rostro curvato ca. 2 mm longo, ventro carinatum, dorso sulcatum, dense pilis longis et brevissimis obtectum, complete biloculare.

3. Astragalus pulchellus group

Plants acaulescent. Leaflets ovate-oblong or obovate, imbricate. Flowers violet. Standard limb rhomboid. Pods stipitate, terminating into a long beak, covered with scattered long hairs inserted in little tubercles.
Astragalus pulchellus, A. deickianus, A. pseudopulchellus.

5. Astragalus pulchellus Boiss., Diagn. Pl. Or. Nov. 2: 86. 1843; **Isotypes:** Prope Ispahan, *Aucher Eloy 4426* (FI!, W!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 93. (habit); pages 217 (indument of peduncle and pods) and 222 (flower dissection).

Plants acaulescent, ca. 5-6 cm tall. Stipules ca. 4-5 mm long, pilose, lanceolate, at a length of ca. 3 mm adnate to the petiole, jointed to one another. Leaves 5-7 cm long, petiole 1-1,5 cm, both petiole and rachis covered with spreading hairs. Leaflets 6-7 pairs, ovate-oblong, ca. 4-6 mm long and ca. 2 mm broad, hairy on both sides. Inflorescence with 9-10 flowers. Peduncle ca. 2-2.5 cm long, covered with spreading hairs. Bracts linear ca. 2 mm long, covered with white hairs or mixed with black and white hairs. Calyx tubular, ca. 7 mm long, covered with white hairs or mixed with black and white hairs, the teeth subulate ca. 1 mm long. Corolla purplish or violet. Standard ca. 16 mm long, the limb rhomboid, ca. 8 mm broad, shortly attenuated toward the tip. Wing petals ca. 12 mm long, the limb oblong-elliptic, rounded at apex, auriculate at the base, equaling the claw. Keel ca. 10 mm long, the limb oblique-elliptic, equaling the claw. Ovary pilose, sessile or stipitate. Pods ca. 13-14 mm long and 4 mm broad, attenuate toward the apex, rostrate-tipped, at the base distinctly stipitate, ventrally carinate, dorsally deeply sulcate, densely covered with hairs inserted in little tubercules, bilocular.

Note:
This species shows some similarity with *A. deickianus* which is largely distributed in the western parts of the country. It seems that the latter taxon has nearly the same variation in the size of the leaves and the calyx and further knowledge may lead to the subsumption of *A. deickianus* as a subspecies under *A. pulchellus*.

Specimens seen:

Fars: 60 km S Abadeh, Kuh-e Bul, near Eghlid, 2470 m, *Foroughi 17373* (TARI); 33,6 km S Deh-Bid, 2070 m, *Pabot 5912* (28589) (TARI); Ibidem, *Pabot 5925* (28588) (TARI).
Esfahan: Esfahan to Chadegan, Gardaneh Sorkh, 2200 m, *Nowroozi 209* (Esf); Chadegan, Menergan, 2300 m, *Nowroozi 202* (Esf.); Damaneh, 2100 m, 3.5.1974, no. 162; Borowjen, protected station, *Maassoumi 55161* (TARI).
Bakhtiari: Borowjen, Gandoman, Kuh-e Baraftab, 2300 m, *Mozaffarian 54769* (TARI).
Tehran: Qazvin, 1500-1550 m, 13.4.1963, *Jacobsen 6198* (BM).
Azarbayejan: Urmiyeh, Sheikh Tappeh, 28.5.1981, *Amini 1357* (TARI).

6. Astragalus deickianus Bornm. in Notizbl. Bot. Gart. Berlin-Dahlem, 14: 274. 1938. **Type:** zwischen Hamadan und Kasr Schirin, IV. 1935, *Deicke* (B) n.v.
= *A. aligudarzicus* Parsa, Fl. de l'Iran 9: 59. 1966. **Isotype:** Aligudarz, 3.1956,*Parsa?* (K!).

Fig.: MAASSOUMI, A. A., 1990,Illustr. guide gen. Astrag. Iran 1: plate 82. (habit); - pages 217 (indument of peduncle and pods) and 222 (flower dissection).

Plants acaulescent, 10-13 cm tall. Stipules 6-8 mm long, pilose, at a length of 3-4 mm adnate to the petiole and jointed to one another. Leaves 5-6 cm long, petiole ca. 1-2 cm. Leaflets 9-11 pairs, contiguous, elliptic or obovate, 6-8 mm long and 4 mm broad, pilose on both sides. Inflorescence a dense spike, peduncle 7-8 cm long. Bracts linear, ca. 4 mm long, covered with black and white hairs. Calyx tubular, ca. 8 mm long, covered with black and white hairs, the teeth subulate, 1-2 mm long. Corolla violet. Standard 17 mm long, the limb rhomboid, 7 mm broad, at the apex truncate or emarginate. Wing petals 15 mm long, the limb narrowly elliptic, in upper part attenuate, at the base auriculate, the limb equaling the claw.

Keel 13 mm long, the limb elliptic, shortly curved, the claw slightly longer than the limb. Ovary pilose, stipitate. Pods with a stipe ca. 3-4 mm long, ca. 20 mm long and 4 mm broad, terminating in a long recurved subulate beak ca. 3-4 mm long, ventrally carinate, dorsally sulcate, covered with long white bristle-like hairs, bilocular.

Specimens seen:

Bakhtiari: Borujen, protected station, 2120 m, 24.5.1986, *Mozaffarian 54401* (TARI).
Kordestan: Dasht-e Zaghe, on road from Hamadan to Sanandaje, ca. 40 km E of Sanandaje, 2200 m, 11.5.1975, *Wendelbo & Assadi 1988* (TARI) - West central Kordestan, 1500-1700 m, 16.5.1963, *Jacobsen 6596* (BM).
Hamadan: Avadje, Sultan-Bulagh mts. 2000-2400 m, 13.5.1987, *Maassoumi & Abouhamzeh 59381, 59384* (TARI) - Ecbatan sad to Yalfan village 2000 m, 10.5.1087, *Maassoumi 5933*, (TARI); ca. 20 km from Ectbatan sad on the road to Malayer, S. of Yalfan village, 16.5.1985, *Maassoumi 52094* (TARI).
Zanjan: Lelaveh to Tahan, 1800-2200 m, 8 Jun, 1977, *Moussavi & Tehrani 36819* (Evin)

7. Astragalus pseudopulchellus Maassoumi sp. nov.

Plant distinguishable from its nearest relatives *A. pulchellus* Boiss. , *A. deickianus* Bornm. and *A. senilis* Bornm. by the well developed stem, the abruptly acuminate stipules and the short fruit.

Holotypus: Lorestan: 55 km form Arak to Malayer (UT3) 2100 m, 15.6.1984, *Mozaffarian & Maassoumi 48087* (TARI!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 92. (habit); page 219 (indument of peduncle and pods).

Plantae, caulescentes ca. 25 cm altae. Caudex multiceps. Caules ca. 7 cm longi, crassi, subpatenter albipilosi. Stipulae ovatae, appresse albo-pilosae, margine ciliatae, distincte nervosae apicem versus abrupte attenuatae, at a length of ca. 3 mm petiolo adnatae, inter se connatae. Folia 10-14 cm longa, petiolo ca. 3-4 cm longo. sicut rachis dense patenter piloso. Foliola ca. 11-13 juga, complicata, juvenilia imbricata, utrimque appresse pilosa, ca. 10 mm longa et 4-6 mm lata, apice rotundata ver emarginata. Inflorescentiae axillares, pedunculo (5-) 10-12 cm longo, laxiuscule brevissime patenter piloso suffultae. Bractae subulatae, ca. 4-5 mm longae, albi-nigri- pilosae. Calyx tubulosus ca. 8-9 mm longus, purpureus, albi-nigri-pilosus, dentibus subulatis ca. 2 mm longis. Corolla violacea (in sicco). Vexillum 17 mm longum, lamina rhomboida, ca. 8 mm lata, apice emarginata. Alae carinaque ignotae. Ovarium pilosum, stipitatum. Legumen stipe ca. 1,5-2 mm longo suffultum, ellipsoideum, apicem versus attenuatum, antice rostratum, rostro ca. 2-3 mm longo, ventro carinatum, dorso rotundatum et profunde sulcatum, dense pilis patentibus in tuberculis minutis insidentibus obtectumer pilosum, complete biloculare.

II. <u>Subsect. Malacothrix</u>

Plants caulescent or acaulescent. Leaflets remote, very rarely contiguous, ovate-oblong or elliptic, sometimes linear. Flowers yellow or violet. Standard obovate or rhomboid. Pods sessile or stipitate.

4. Astragalus pauperiflorus group

Small herbs with short leaves and small leaflets, covered with short appressed hairs. The limb of wing petals retuse or minutely tridentate. Standard rhomboid, not ligulate-attenuate toward the apex. Bracts subulate. Calyx shortly tubular, the theeth shorter than tube.
Astragalus pauperiflorus, A. rudimentus.

8. Astragalus pauperiflorus Bornm. in Mitth. Thür. Bot. Ver., N. F. 23: 4. 1908. **Holotype:** Azarbayejan: prope Isperechan, in montis Sahand, *Knapp* (WU!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 88. (habit); pages 221 (indument of peduncle and pods) and 222 (flower dissection).

Plants small, prostrate on the soil surface, ca. 3-5 cm tall, acaulescent or with a short stem up to 1,5 cm long. Stipules membranous, ca. 3-4 mm long, glabrous, ciliate at the margin, at the base shortly adnate to the petiole and shortly jointed to one another. Leaves ca. 2-4 cm long, petiole ca. 1 cm long, both petiole and rachis covered with short appressed hairs. Leaflets ca. 11 pairs, obovate or elliptic, ca. 4 mm long and 2 mm broad, upper side glabrous, lower side with short appressed hairs along the mid-rib, shortly pilose at the margin. Inflorescences spike-like, peduncle 1-2 cm long, covered with short appressed white hairs or mixed with some black hairs. Flowers 6-8, nearly sessile. Bracts small, ca. 1 mm long, membranous, at the margin with white hairs or mixed with black hairs. Calyx tubular, ca. 6 mm long, covered with white hairs or mixed with blackish hairs, the teeth triangular, ca. 1-2 mm long. Corolla yellow with violet keel. Standard ca. 14 mm long, the limb elliptic or obovate, incised at the apex, constricted at the base near to the claw. Wing petals ca. 12 mm long, the limb elliptic, asymmetrically notched at the apex, at the base with an auricle ca. 1,5 mm long, claw equaling the limb. Keel ca. 9 mm long, the limb elliptic-recurved, acuminate, claw longer than the limb. Ovary pilose, sessile. Pod (immature) ca. 3 mm long and 1,5 mm broad, covered with long hairs.

Specimens seen:

Azarbayejan: Sarab, Kuh-e Goush 2000-3100 m, *Izadyar 14695* (Evin); Kuh-e Sabalan, 2960 m, *Riazi 7496* (TARI); Irydash (Savalan), 2850 m, *Javanshir 693* (University of Tabriz).

9. Astragalus rudimentus Maassoumi in Iran. J. Botany 5: 14. 1991. **Holotype:** Azarbayejan, Ardebil to Ghotour-Sou, Kuh-e Sabalan, 3400-3600 m, 15.7.1971, *Termeh 40821.* (Evin!; Iso: TARI!)

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 95. (habit); - pages 219 (indument of peduncle and pods) and 222 (flower dissection).

Plants acaulescent, small, ca. 4-6 cm tall with divided caudex. Stipules lanceolate, covered with white hairs, 3-4 mm long, at a length of ca. 1 mm adnate to the petiole and shortly jointed to one another. Leaves ca. 2-2.5 cm long, petiole ca. 5-6 mm long, petiole and rachis densely covered with white appressed hairs. Leaflets imbricate, ca. 8-10 pairs, elliptic or lanceolate, ca. 4 mm long and 1-2 mm broad, both sides densely covered with appressed hairs. Inflorescence nearly capitate, 5-6 flowered, peduncle ca. 2,5-3 (-5) cm long, straight or recurved, densely covered with white appressed hairs at the base, toward the inflorescence mixed with black hairs. Bracts narrowly ovate with black and white hairs, ca. 3 mm long. Calyx tubular, ca. 10-

11 mm long, covered with black and spreading white hairs. Corolla yellow, changed to violet. Standard ca. 14-15 mm long, the limb rhomboid, in the middle part ca. 6 mm broad. Wing petals ca. 11 mm long, the limb narrowly elliptic, at the apex minutely dentate, at the base with an auricle ca. 1 mm long, the limb equaling the claw. Keel ca. 10 mm long, the limb oblique-elliptic, equaling the claw. Ovary sessile, pilose. Pods ovoid, ca. 6-7 mm long and 4 mm broad, recurved at the apex, ventrally rounded, dorsally applanate and sulcate, densely covered with long white hairs mixed with short spreading hairs, bilocular.

Specimens seen:

Azarbayejan: Ardebil to Ghotour-Sou, Kuh-e Sabalan, 3400-3600 m, 15.7.1971, *Termeh 40821*. (Evin; TARI) Osku to Sahand, Kuh-e Soltan, 2600-3130 m, 22.6.1985, *Termeh, Moussavi & Tehrani 41595* (EVIN); N. of Savalan, 3500-3800 m, 30.8.1987, *A. Javanshir 1263* (University of Tabriz); mt. Savalan, Herman mts. 3500-3800 m, 29.7.1987, *A. Javanshir 1251* (UT); Yekly Yeyglaghy (Sabalan mt.) 3420 m, 29.5.1987, *Javanshir 19741* (UT); Savalan 2935-3410 m, 18.8.1986, *Javanshir 1074* (UT); Sarab to Sabalan, 24.7.1968, *Termeh 13325* (EVIN); ibidem, *Rechinger, Lamond & Termeh 44190* (W).

5. Astragalus melanodon group

Plants scapose, acaulescent or very shortly caulescent. Bracts subulate, densely covered with black hairs. Calyx tubular, the teeth triangular, much shorter than the calyx tube. Peduncle much longer than the subtending leaves, recurved. Flowers white. Standard rhomboid, not ligulate-attenuate toward the apex, or obovate.
Astragalus melanodon, A. tenuiscapus, A. griseus.

10. Astragalus melanodon Boiss., Diagn. Pl. Or. Nov. 6: 36 (1846). **Type:** In summis alpis Kuh-e Daena, *Th. Kotschy 765* (FI!, W!).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 83. (habit); - pages 218 (indument of peduncle and pods) and 222 (flower dissection).

Plants ca. 10-16 cm tall, with stems ca. 3-5 cm long. Stipules triangular-acuminate, ca. 4 mm long, at the base free from the petiole and shortly jointed to one another. Leaves 4-9 cm long, petiole ca. 3-4 cm, both petiole and rachis covered with short appressed or subpatent hairs. Leaflets 5-6 pairs, elliptic, ca. 12-16 mm long and 3-5 mm broad, both sides covered with appressed hairs. Inflorescence a dense spike with numerous flowers, peduncle ca. 4-6 cm long, covered with short, black and white hairs. Bracts narrowly ovate, ca. 2 mm long, with black and white hairs. Calyx cylindric, ca. 7-8 mm long, covered with black and white hairs, the teeth subulate, ca. 1 mm long. Corolla yellow. Standard ca. 15 mm long, the limb rhomboid, round-tipped or round-tipped. Wing petals ca. 12-13 mm long, the limb elliptic, round-tipped or roundly-tipped at the base with an auricle ca. 1 mm long, shortly longer than the claw. Keel ca. 11 mm long, the limb oblique-elliptic or triangular, shorter than the claw. Ovary pilose, sessile. Legume unknown.

Specimens seen:

Yazd: W. of Yazd, Terejan, Barf-Khaneh, 3350 m, 23.6.1975, *Foroughi & Assadi 18024* (TARI).
Semnan: Shahrud, Gharieh-ye Tash, Kuh-e Shahvar, 3000-3650 m, 31. July 1975 (EVIN).

Fars: Kuh-e Nav, Kuh-e March, Bonrud, 5.6.1968 (EVIN); Kuh-e Daena 3500 m, Sept. 1955, *5243 E* (EVIN); Dena Sitsehani (Sisakht), 2.8.49, *1088* (EVIN); Kuh-e Dena, Darreh Sicani, 21.7.49, *1080 E* (EVIN); Abadeh, Kouh-e Dena, Gardaneh-Ye Bijan 3030 m, 25.7.1987, *Termeh, Delghan & Tehrani* (EVIN); Kuh-e Dena, Gadaneh Bijan, 3500-3900 m, 2.8.1978, *Assadi & Mozaffarian 31241, 31226* (TARI).

Kerman: Kuh-e Jebal-Barez, 35 km ab oppido Jiroft, 1600-3000 m, 4.5.1973, *Sojak 4152, 4177* (PR).

11. Astragalus tenuiscapus Freyn et Bornm. in Bull. Herb. Boiss. 5: 590. 1897. **Type:** Kerman, inter lapides ad nives deliquescentes montis Kuh-e Lalezar, 3900-4000 m, *Bornmüller 3777* (B, non vidi).

Fig.: Pages 218 (indument of peduncle and pods) and 222 (flower dissection).

Plants acaulescent, ca. 6-8 cm tall, with branched caudex and stems prostrate at the surface of the soil. Stipules ca. 3 mm long, covered with spreading hairs. Leaves ca. 2-3 cm long, petiole short, both petiole and rachis densely covered with spreading hairs. Leaflets 8-9 pairs, obovate, ca. 5 mm long and 4 mm broad, complicate, both sides densely covered with spreading hairs. Inflorescence a dense spike or capitate; peduncle ca. 3-5 cm long, thin, usually deflexed, densely covered with spreading black and white hairs; flowers 8-10, nearly sessile. Bracts ovate, ca. 1-2 mm long, covered with spreading black and white hairs. Calyx tubular, ca. 9-10 mm long, densely covered with black hairs or mixed with white hairs, the teeth subulate, ca. 3 mm long. Corolla white. Standard ca. 18 mm long, the limb rhomboid, ca. 9 mm broad, round tipped, at the base near the claw constricted. Wing-petals ca. 15 mm long, the limb elliptic, round tipped, at the base auriculate, auricle ca. 1 mm long, claw shorter than the limb. Keel ca. 14 mm long, the limb oblique elliptic, claw longer than the limb. Ovary pilose, shortly stipitate. Pods ovoid, ca. 12 mm long and 7 mm broad, ventrally rounded, dorsally sulcate, valves of the pod membranous, thin, covered with long silky whitish hairs mixed with short spreading blackish hairs, semi-bilocular.

Specimens seen:

Esfahan: N side of Kuh-e Dena, above the village Noghol, 3500-4000 m, 6.7.1983, *Assadi & Abouhamzeh 46164* (TARI).

Fars: Kuh-e Dena, Gardaneh-e Bijan, 3000-3600 m, *Assadi & Mozaffarian 31174* (TARI); Kuh-e Dena, supra Sissakht, 3400-4000 m, 14.6.1977, *Sojak 6349, 6193, 6240* (PR).

Kerman: Darzin to Deh Bakry, 1750 m, *Jaafary & Heravi* (EVIN); Kerman, Laleh Zar, Baghabad, 2900 m, 19.6.1975, *Foroughi & Assadi 17907* (TARI); Baft, Kuh-e Laleh Zar to Gholleh Shah, 3000-3800 m, 30.5.1975, *Moussavi & Tehrani s.n.* (EVIN); S slope of Kuh-e Khabr, 3500 m, 8.6.1977, *Assadi & Miller 2519* (TARI).

12. Astragalus griseus Boiss., Diagn. Pl. Or. Nov. 6: 36. 1846. **Type:** in siccis reg. superiorum alpis Kuh-Delu, *Th. Kotschy 527* (G!, FI!,K!, W!).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 69. (habit); - pages 218 (indument of peduncle and pods) and 222 (flower dissection).

Plants ca. 8-13 cm tall, caulescent. Stipules triangular, ca. 8 mm long, covered with white hairs or mixed with black hairs, at the length of ca. 1 mm adnate to the petiole. Leaves ca. 5-8 cm long, petiole short, ca. 2 cm long, both petiole and rachis sulcate, covered with long white hairs mixed with short spreading hairs. Leaflets 9 pairs, complicate, covered with silvery

appressed hairs, elliptic or obovate, ca. 6 mm long and 4 mm broad. Inflorescence subterminal, capitate, peduncle ca. 3-10 cm long, at the base covered with long and short whitish hairs, and below the inflorescence mixed with short blackish hairs: flowers numerous with very short pedicel. Bracts lanceolate, ca. 5-6 mm long, covered with black and white hairs or rarely only with white hairs. Calyx tubular, ca. 12-13 mm long, covered with black and white hairs, the teeth subulate, ca. 2-3 mm long. Standard ca. 16 mm long, the limb rhomboid, at the tip incised or shortly emarginate, at the base near the claw constricted. Wing-petals ca. 15 mm long, the limb elliptic, toward the apex shortly attenuate, round tipped, at the base auriculate, the claw 2 times longer than the limb. Keel ca. 12 mm long, the limb triangular or curved, acute at the apex, the claw 2 times longer than the limb. Ovary pilose, sessile. Pod ovoid, sessile, ca. 7-8 mm long and 4 mm broad, ventrally carinate, dorsally sulcate, at the apex terminating in a recurved beak, covered with long shoft whitish or yellowish hairs mixed with short spreading white hairs, bilocular.

Specimens seen:

Fars: Bamu protected region, Cheshmeh Fil to ridge of Kuh-Bamu, 1900-2650 m, 31.5.1975, *Wendelbo & Foroughi 11691* (TARI); Kuh-Mareh, *Bonroud, Kashkouli & Misayans s.n.* EVIN).
Bakhtiari: Prope Semirom, Kuh-e Surmandeh, 2750-3600 m, 7.6.1974, *Iranshahr* (EVIN).

6. Astragalus holosemius group

Scapose, acaulescent. Bracts narrowly ovate, densely covered with black and white hairs. Calyx tubular minutely inflated, the teeth triangular shorter than the calyx tube, peduncle longer than or equaling the subtending leaves, erect. Flowers violet. Standard rhomboid, attenuate toward the apex.
Astragalus holosemius, A. beckii, A. rusticus, A. aspadanus, A. lisaricus.

13. Astragalus holosemius Bunge. in Mém. Acad. Imp. Sci. Saint-Petersbourg 11 (16): 55. 1868 in clave et l.c. 15 (1): 89. 1869; **Type:** Prov. Azarbayejan, *Aucher-Eloy 4418* (FI!, K!).

Fig.: Page 222 (flower dissection).

Plants ca. 15-25 cm tall, acaulescent or shortly caulescent, stems ca. 2 cm long, from a much divided stock. Stipules narrowly triangular, acuminate, divergent, pilose, ca. 5-7 mm long, at the base shortly adnate to the petiole and jointed to one another, rugulose at the base. Leaflets 14-16 pairs, narrowly elliptic or ovate-oblong, obtuse or acuminate, ca. 10-12 mm long and 5-7 mm broad, both sides densely covered with appressed hairs. Inflorescens long pedunculated, capitate, with numerous, shortly pedicellated flowers. Bracts subulate, densely covered with black hairs, ca. 5 mm long. Calyx tubular, very rarely slightly inflated, ca. 12-14 mm long, densely covered with spreading black and white hairs, the teeth subulate ca. 2-3 mm long. Corolla purplish or violet. Standard 22-27 mm long, the limb rhomboid, ca. 8-9 mm broad, ligulate-attenuate toward the apex. Wing-petals ca. 18-20 mm long, the limb elliptic, minutely asymetrically dentate at the apex, at the base auriculate, auricle ca. 2 mm long, claw longer than the limb. Keel ca. 15-18 mm long, the limb oblique-elliptic, claw longer than the limb. Ovary pilose. Pods ellipsoid ca. 10-13 mm long, attenuate toward the apex, ventrally carinate, dorsally applanate, sulcate, densely vested with long white or yellow hairs mixed with short spreading hairs, fully bilocular.

Specimens seen:

Azarbayejan: 22 km SW Ahar, 1550 m, *Pabot 3259* (28579) (TARI); Between Khalkhal and Ardebil, protected area of Lisar, 2500 m, *Maassoumi & Abouhamzeh 56940* (TARI); Sarab, Narmigh mts., 220-2400 m, *Termeh & Daneshpajuh 41366* (EVIN); Montes Sabalan, Qotur-Su, 2300-2800 m, *Lamond & Termeh 440070* (EVIN); Kiamaki protected region, in monte Mohammad-Saleh, 2600-2900 m, *Rechinger 56921*(W); Kuh-s Sahand, 2200-2900 m, *Assadi & Mozaffarian 30665* (TARI).

14. Astragalus beckii Bornm. in Mitth. Thüring. Bot. Ver., N.S. 23: 5. 1908. **Type:** In valle fluvii Sefid-rud in montium prope Rudbar, 7.5.1902, *Bornmüller 6770* (E!).
= *A. stridii* Kit Tan in Aliso 11: 621. 1987. **Holotype:** Turky, C5 Nigde: Narpiz valley, NW part of Aladagh, ca. 6 km SE of Demirkazik köyii, limstone scree and rock, 2800-3000 m, 23.7.1984, *G. Görk, P. Hartvig & A. Strid* et al. *23923* (C; Iso: E!).

Fig.: MAASSOUMI, A.A., 1990, Illustr. guide gen. Astrag. Iran 1: plate 81 (habit); - pages 218 (indument of peduncle and pods) and 222 (flower dissection).

Plants ca. 15-20 cm tall, stems 1-2 cm long with very short internodes at the base. Stipules triangular, pilose, ca. 2-3 mm long, at the base nearly free from the petiole and shortly jointed to one another. Leaves 5-6 (-13) cm long, petiole ca. 2 cm long, both petiole and rachis covered with short appressed hairs. Leaflets 10-12 pairs, oblong-elliptic, obtuse, rounded at apex or very rarely emarginately tipped, 5-8 mm long and 3-5 mm broad, both sides covered with appressed hairs. Inflorescence at first a dense spike and elongating in flower. Peduncle ca. 6-11 cm long, at the base covered with appressed white hairs and below the inflorescence mixed with nearly spreading black hairs; flowers 7-15, with very short pedicel. Bracts ca. 3 mm long, covered with black and white hairs. Calyx tubular, ca. 12-13 mm long, covered with black and white hairs, the teeth triangular, ca. 2 mm long. Corolla violet. Standard ca. 20-23 mm long, the limb rhomboid, ca. 8 mm broad, distinctly attenuated towards the apex, emarginately tipped or bilobate. Wing-petals ca. 18 mm long, the limb narrow-elliptic, asymmetricaly notched at apex, at the base auriculate, with auricle ca. 1,5 mm long, the limb slightly shorter than the claw. Keel ca. 15 mm long, the limb oblique-elliptic, 1/2 length of the claw. Ovary pilose, shortly stipitate. Fruit (immature) ca. 10 mm long covered with long soft hairs, bilocular.

Notes: This species is in some respects similar to *A. melanodon* Boiss. and *A. tenuiscapus* Freyn & Bornm., but it differs in having much longer calyx (ca. 12-13 mm) and in the standard limb shape which is strongly ligulate toward the apex.

Specimens seen:

Mazandaran: N side of Kandavan tunnel, 2600 m, 23.5.1974, *Wendelbo & Shirdelpur 11659* (TARI); Haraz road at Abgarm, 2250 m, 23.6.1979, *Assadi & Mozaffarian, 33119* (TARI).
Tehran: Qazvin, 37 km from Qazvin to Manil (Kuhin neck), 1300 m, 3.6.1986, *Maassoumi 55150* (TARI); Chalus road, top region of Kandavan mts., 3000 m, 3.6.1986, *Maassoumi 55119* (TARI).

15. Astragalus rusticus Maassoumi in Mitt. Bot. Staatss. München, 29: 506 (1990); **Holotype:** Azarbayejan, Kandovan road to Esfanjan, before of Kuhnamaku, 2090 m, 21.5.1981, *Olfat & Sarkarat 233* (TARI!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 96 (habit); - pages 219 (indument of peduncle and pods) and 222 (flower dissection).

Plants acaulescent, ca. 10-11 cm tall. Stipules lanceolate, ca. 5-8 mm long, covered with white hairs, at a length of ca. 2 mm adnate to the petiole and jointed to one another. Leaves ca. 5-6 cm long, petiole ca. 1-1,5 cm long, both petiole and rachis densely covered with long and short subappressed hairs. Leaflets ca. 11-12 pairs, narrowly elliptic, acuminate or rarely obtuse, ca. 5-7 mm long and 2-3 mm broad, upper side covered with subappressed hairs, lower side with appressed hairs. Inflorescence solitary, 7-9 flowered; peduncle ca. 5-6 cm long, densely covered with long and short spreading hairs. Bracts lanceolate, ca. 5-6 mm long, covered with black and white hairs. Calyx tubular ca. 11-12 mm long, covered with long white hairs mixed with short black hairs, the teeth linear, ca. 3-3,5 mm long. Corolla dark violet. Standard ca. 18 mm long, the limb rhomboid, emarginate at the apex. Wing-petals ca. 17 mm long, the limb oblong, dilated toward the apex, at the base shortly auriculate, the limb equaling the claw. Keel ca. 15 mm long, the limb elliptic. Ovary pilose, stipitate. Pods unknown.

Specimens seen:

Azarbayejan: Kandowan road to Esfanjan, before of Kuhnamaku, 2090 m, 21.5.1981, *Olfat & Sarkarat 233* (TARI).

16. Astragalus aspadanus Bunge in Mém. Acad. Imp. Sci. Saint-Petersbourg 11(16): 63. 1868 in clave et l.c. 15 (1): 107. 1869. **Holotypus:** In Persia media occidentali prope Isfahan, *Bode* (LE) non vidi.

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 57 (habit).

Plants acaulescent, with much divided stock, ca. 17 cm tall. Stipules lanceolate, acuminate, pilose, ca. 5-7 mm long, at the base shortly adnate to the petiole, jointed to one another. Leaflets 14-16 pairs, ovate-oblong, rounded at apex, ca. 10 mm long and 4-5 mm broad, both sides covered with appressed hairs. Inflorescence capitate, with many flowers; peduncle 10-15 cm long, densely covered with appressed hairs. Bracts linear, covered with black hairs, ca. 5 mm long. Calyx tubular, ca. 13 mm long, strongly inflated at the base, densely covered with black and white spreading hairs, the teeth subulate, ca. 2-3 mm long. Corolla violet. Standard ca. 22 mm long, the limb rhomboid, ca. 8 mm broad. Wing-petals ca. 18 mm long, the limb elliptic, asymmetrically dentate at apex, at the base auriculate, auricle ca. 2 mm long. Keel ca. 15-16 long, the limb oblique-elliptic. Ovary pilose. Pods elliptic, ca. 10-12 mm long, ventrally carinate, dorsally applanate or slightly sulcate, recurved-rostrate at the apex, recurved, densely covered with long white lanate hairs mixed with short spreading hairs, fully bilocular.

Note: This species is transferred from section *Grammocalyx* to section *Malacothrix*. In young stages the calyx is inflated, but in fruiting time it is ruptured by the pod.

Specimens seen:

Esfahan: Chadegan, above Analogeh, Dalan-Kuh, 2650-3000 m, *Nowroozi 305* (TARI).
Hamadan: Ecbatan sad to Yalfan village, 2000 m, *Maassoumi 59333* (TARI).

17. Astragalus lisaricus Maassoumi sp. nov.
Holotypus: Azarbayejan: between Khalkhal and Ardebil, protected area of Lisar, 2500 m, 23.6.1989, *Maassoumi & Abouhamzeh 56940* (TARI; Iso.: Herb. Podl.).

Differt ab *A. becki* Bornm. foliolis angusti-ellipticis (nec oblongi-ovatis), stipulis majoribus, ad basin petiolo brevissime adnatis (nec libris), floribus albis (nec intense violaceis), calyces minore, subinflato, dentibus ejus linearibus,. Bracteis linearibus (nec ovatis).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 82 (habit, flower dissection).

Plantae acaules, ca. 10 cm altae. Stipulae lanceolatae acuminatae ca. 7 mm longae, albipilosae, basi petiolo breviter adnatae inter so connatae. Folia ca. 4-5 cm longa, petiolo ca. 1,5-2 cm longo, sicut rachis dense subappresse albipiloso. Foliola 10-12 juga, angusti-elliptica, 6-7 mm longa et 2-3 mm lata, utrinque dense appresse pilosa. Inflorescentia solitaris, capitulo 6-15 floro formans. Bracteae lanceolatae, ca. 5-6 mm longae, dense patenter albi-nigri-pilosae. Calyx tubulosus ca. 11-12 mm longus, manifeste inflatus, paralleliter purpurescenti-nervosus, dense longe patenter albi-nigri-pilosus, dentibus linearibus, ca. 5 mm longis, nigripilosis. Corolla in vivo alba, in sicco pallide violacea. Vexillum ca. 20 mm longum, lamina rhomboida ca. 10 mm lata, apice leviter emarginata. Alae ca. 17 mm longae, lamina oblongi-elliptica, apicem versus attenuata, antice acuta, basi auriculata, auricula ca. 1,5 mm longa, ungue lamina longiore. Carina ca. 15 mm longa, lamina triangulare, ungue lamina duplo longiore. Ovarium pilosum. Legumen ca. 8-10 mm longum et 3-4 mm latum, ventro late carinatum, dorso rotundatum profunde sulcatum, dense albi-lanatum pilis brevissimis patentibus immixtis, complete biloculare. Semina 4.

7. Astragalus patrius group

Plants scapose, acaulescent. Bracts linear, covered with black and white spreading hairs. Calyx tubular. Flowers yellow. Standard elliptic. Pods stipitate, densely covered with long silky hairs.
Astragalus patrius.

18. Astragalus patrius Maassoumi in Iran. J. Bot. 4: 137. 1988. **Holotype**: ca. 30 km S of Ramsar, Shah-e Sefid Kuh, 3100-3400 m, 12.7.1984, *Assadi & Maassoumi 51297* (TARI).

Fig.: MAASSOUMI, A. A. 1993, Illustr. guide gen. Astrag. Iran 2: plate 87 (habit); pages 219 (indument of peduncle and pod) and 222 (flower dissection).

Plants acaulescent with divided stock. Stems prostrate at the surface of the soil, ca. 12-14 cm long. Stipules lanceolate ca. 5 cm long, covered with black and white appressed hairs, at the base shortly adnate to the petiole and shortly jointed to one another. Leaves ca. 8-10 cm long, petiole ca. 2-3 cm long, both petiole and rachis covered with subpatent white hairs. Leaflets 12-13 pairs, oblong or elliptic, ca. 8-9 mm long and 3-4 cm broad, round tipped, cuneate at the base, both sides covered with appressed hairs. Inflorescence terminal, spherical, with 7-9 flowers; peduncle ca. 10-13 cm long, in the lower part with white appressed hairs, in the upper part below the inflorescence mixed with black hairs. Bracts linear, ca. 5 mm long, covered with black and white spreading hairs. Calyx tubular, ca. 13 mm long, densely covered with black and white hairs. Corolla yellow. Standard ca. 18-19 mm long, the limb oblong-elliptic, emarginate at the apex, at the base near the claw constricted. Wing-petals ca. 16-17

mm long, the limb narrowly elliptic, round tipped, at the base shortly auriculate, auricle ca. 1 mm long, claw 1.5 times longer than the limb. Keel ca. 14 mm long, the limb elliptic, recurved at the acute apex, at the base auriculate, claw 1.5 times longer than the limb. Pod shortly stipitate, ovoid, ca. 9 mm long and 5 mm broad, ventrally rounded, dorsally sulcate, rostrate at apex, covered with long silky hairs, fully bilocular. Seeds 2, reniform, ca. 3 mm long, brown.

Specimens seen:

Mazandaran: ca. 30 km S of Ramsar Shah-e Sefid Kuh, 3100-3400 m, 12.7.1984, *Assadi & Maassoumi 51297* (TARI).
Zanjan: Toward Mahneshan, Nopa, 1750-200m, 22.6.1983, *41085* (EVIN).

8. Astragalus plebejus group

Small herbs, acaulescent or with very short stem. Bracts subulate. Calyx campanulate, the teeth setaceous as long as or shorter than the tube. Pods ovaloid.
Astragalus plebejus, A. babakhanloui, A. chahartaghensis.

19. Astragalus plebejus Boiss., Diagn. Pl. Or. Nov. 6: 37 (1845). **Type:** Persias austro-occid., Kuh-Delu, 11.6.1842, *Th. Kotschy 485* (FI! W!).

Fig.: MAASSOUMI, A. A. 1990, Illustr. guide gen. Astrag. Iran 1: plate 90 (habit); - pages 218 (indument of peduncle and pods) and 222 (flower dissection).

Plants acaulescent, ca. 3-6 (-12) cm tall. Stipules acuminate, hairy, ca. 2 mm long. Leaves 2-4 (-6) long, petiole ca. 2-3 cm long, both petiole and rachis covered with short spreading hairs. Leaflets 7-10 pairs, complicate, elliptic, 6-8 mm long and 2-3 mm broad, densely hairy on both sides. Inflorescence a spike with numerous flowers; peduncle ca. 2-3 (-9) cm long, covered with spreading hairs. Bracts very short, ca. 1 mm long, pilose. Calyx tubulose, ca. 10 mm long, covered with black and white spreading hairs, the teeth setaceous, ca. 4-5 mm long. Corolla violet. Standard ca. 10-11 mm, the limb elliptic, retuse at apex or emarginate. Wing-petals ca. 9 mm long. Keel ca. 8 mm long. Ovary pilose, sessile. Pods unknown.

Notes: This species differs from *A. melanodon* Boiss. by its setaceous calyx teeth which are as long as the tube (nut much shorter).

Specimens seen:

Esfahan: Borujen, Kohyan, Bakhtiari, 1700 m, 17.5.1983, *Nowroozi 2529* (Esf.); Esfahan to Shar-e Kurs. Gardaneh Rokh, 2100-2200 m, *Nowroozi 2404* (Esf.)
Bakhtiari: N. slopes of Kuh-e Kallar, S. of Sibak, 2500-3200 m, 4.7.1986, *Mozaffarian 57394* (TARI).
Fars: 128 km, Abadeh road, 1800 m, *Riazi 9108* (TARI).

20. Astragalus babakhanloui Maassoumi & Podlech in Iran. J. Bot. 4: 72. 1988. **Holotype:** Lorestan, 55 km from Arak to Malayer (VT3), 2100 m, 15.6.1984, *Mozaffarian & Maassoumi 48083* (TARI!; Iso: Herb. PODLECH!).

Fig.: MAASSOUMI, A. A. & PODLECH, l.c.: 73 (habit); MAASSOUMI, A.A., 1990, Illustr. guide gen. Astrag. Iran 1: plate 80 (habit); - pages 219 (indument of peduncle and pods) and 222 (flower dissection).

Plants shortly caulescent, 5-15 cm tall, vested with appressed white hairs. Stems 1-5 cm long. Stipules membranaceous, the lower ones ca. 2 mm long, pilose, shortly jointed to one another, the upper ones lanceolate-triangular, densely pilose, lengthwise more united to one another. Leaves 4-6 cm long, petiole equaling the limb, covered with appressed hairs. Leaflets 3-6 pairs, narrowly elliptic, 7-14 mm long and 3-5 mm broad, round tipped, cuneate at the base, both sides vested with appresed hairs. Inflorescence axillar, capitate at first and elongated in fruit, up to 5 cm long; peduncle ca. 2-5 cm long, commonly covered with appressed or subpatent hairs. Bract narrowly ovate, ca. 2 mm long, with white hairs or sometimes mixed with prodominately black hairs. Pedicel very short. Calyx 9-12 mm long, tubular, covered with scattered subpatent hairs, the teeth subulate, slightly longer than the tube. Corolla yellow. Standard 12-13 mm long, the limb elliptic, ca. 5 mm broad, emarginate at apex, cuneate at the base. Wing-petals 10-11 mm long, the limb oblong, rounded at apex, at the base auriculate, equaling the claw. Keel 8-9 mm long, the limb elliptic-triangular, acuminate at apex, 1-5 times shortes than the claw. Pods ovoid, pilose, ca. 7 mm long, 4 mm high and 3.5 mm broad, ventrally carinate, dorsally sulcate, fully bilocular. Seeds 2, ca. 4 mm long.

Specimens seen:

Chaharmahal-e Bakhtiari: Borojen, Boldaji, Kalbibak (Foot mt. of Kallar) 2250 m, 3.7.1986, *Mozaffarian 57386* (TARI); Lordegan Doushalvari, Khong-e Baraftab, 1680 m, 14.5.1987 *Mozaffarian 5990* (TARI); ca. 5 km from Lordegan to Ganduman Park-e Jangali-e Doushalvari, 1640 m, 29.5.1986, *Mozaffarian 54648* (TARI); Semirom, Hana, Chesmeh Khoni 2250 m, 18.9.1985, *Nowroozi 4004* (Esf.)

Fars: 27 km from Nurabad to Korekan, Doshman-ziary region, 2000 m, 31.5.1983, *Mozaffarian 45754* (TARI).

21. Astragalus chahartaghensis Maassoumi & Podlech in Mitt. Bot. Staatss. München 29: 511. 1990. **Holotype:** Chaharmahal-e Bakhtiari, Sabz-kuh, Ghahartagh, 2350 m, 16.5.1987, *Mozaffarian 59968* (TARI!; Iso: Herb. PODLECH!).

Fig.: MASSOUMI, A. A. 1992, Illustr. guide gen. Astrag. Iran 2: plate 63 (habit); - page 219 (indument of peduncle and pods) and 222 (flower dissection).

Plants ca. 3-7 cm tall, with short stem ca. 1-3 cm long. Stipules acuminate, pilose, ca. 4-5 mm long, at a length of 1-2 mm adnate to the petiole. Leaves 5-8 cm long with short petiole, ca. 2-4 cm long, both petiole and rachis covered with spreading hairs. Leaflets (2-) 3-4 pairs, elliptic or obovate, 10-20 mm long and 3-6 mm broad, both sides densely covered with appressed white hairs. Inflorescence a dense spike with numerous flowers: peduncle ca. 2-3 cm long, densely covered with short spreading hairs. Bracts short, ca. 2-2,5 mm long, narrowly ovate, pilose. Calyx tubular, 9-12 mm long, covered with spreading white hairs or rarely mixed with some scattered black hairs, the teeth subulate ca. 5-6 mm long. Corolla violet or yellow but later changed to violet. Standard ca. 12 mm long, the limb elliptic, retuse at apex or emarginate, gradually attenuated at the base. Wing-petals ca. 10 mm long, the limb elliptic, dilated toward the apex, shorter than the claw. Keel ca. 9 mm long, the limb oblique-elliptic, shorter than the claw. Ovary pilose, sessile. Pods unknown.

Specimens seen:

Esfahan: Esfahan to Daran, Ghahis protected area, 2500 m, *Nowroozi 342* (Esf.).
Fars: 15 km N. Shiraz, 1750 m, 28.4.1961, *Pabot 6090* (28581) (TARI).
Bakhtiari: Sabz-Kuh, Chahartang, 2350 m, 16.5.1987, *Mozaffarian 59968* (TARI); Shahr-e Kord, Baba-Heidart, 2150-2500 m, 1.6.1986, *Mozaffarian 54809* (TARI); Brojen, Research Institute protection Station, 2200 m, 13.5.1987, *Mozaffarian 59868* (TARI); Ganduman, Kuh-e Baraftab, 2300 m, 31.5.1986, *Mozaffarian 54777* (TARI).

9. Astragalus hirtus group

Plants acaulescent, densely covered with long bristle-like hairs or strigose. Leaflets narrowly elliptic, complicate, upper side glabrous, lower side densely covered with long bristle-like hairs, inserted in little tubercle.
Astragalus hirtus, A. capillatus.

22. Astragalus hirtus Bunge in Mém. Acad. Imp. Sci. Saint-Petersbourg, 11 (16): 54. 1868 in clave et l.c. 15 (1): 87. 1869. **Type:** Persia, inter Gäs et Murtschehar, N Isfahan, Mai 1859, *Bunge & Bienert* (P!).

Plants acaulescent, ca. 7-8 cm tall, densely covered with long bristle-like hairs or strigose. Stipules lanceolate acuminate, ca. 7-8 mm long, subglabrous or with some scattered short hairs on the outside and ciliate at the margin, at a length of 2-2,5 mm adnate to the petiole and jointed to one another. Leaves ca. 6-7,5 cm long, petiole ca. 2 cm long, both petiole and rachis covered with rigid hairs 4-4,5 mm long. Leaflets ca. 8 pairs, oblong or narrowly elliptic, complicate, remote, 10-12 mm long and 3-4 mm broad, upper side glabrous or with very few isolated hairs toward the margin, lower side densely covered with distinctly tuberculated hairs. Inflorescence (young stage) spherical; peduncle ca. 1-1,5 cm long, densely hirsute. Bracts lanceolate, ca. 4-5 mm long, hirsute. Calyx ca. 8 mm long, hirsute, the teeth ca. 1,5 mm long. Rest of flower and pods unknown.

Notes: This curious species described in sect. *Stereothrix* has been examined by the author on the type specimen. Lenght of calyx teeth, the shape of inflorescence and the remote leaflets do not show any affinity with the species of sect. *Stereothrix*. In my opinion the best position of this interesting species seems to be within sect. *Malacothrix* Bge.

23. Astragalus capillatus Maassoumi sp. nov.
Holotypus: Chaharmahal-e Bakhtiari: Shahr-e Kord, Shalamzar, Agha-Sabz, 28.5.1986, 2400 m, *Mozaffarian 54615* (TARI).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 62 (habit); -pages 221 (indument of peduncle and pods) and 222 (flower dissection).

A species which is distinguishable from its nearest relative *A. hirtus* Bunge by its short stem, covered with long rigid hairs.

Planta perennis, acaulis, ca. 10-14 cm alta, caudex multiceps. Stipulae lanceolatae, acuminatae, ca. 8-10 mm longae, albi-nigri-pilosae, basi per 2-3 mm petiolo adnatae, inter se

connatae. Folia ca. 7-10 cm longa, petiolo ca. 2 cm longo, sicut rachis dense longe albi-piloso. Foliola ca. 8-9 juga, anguste elliptica, ca. 8 mm longa et 3 mm lata, antice obtusa, utrinque patenter pilosa. Inflorescentia solitaris, racemo dense multifloro. Bracteae lineares, ca. 8 mm longae, albi-nigri-pilosae. Calyx tubulosus, ca. 15 mm longus, basi manifeste inflatus, longe albi- et brevissime nigri- pilosus, dentibus setaceis ca. 6 mm longis. Corolla flava, deinde intense violacea. Vexillum ca. 17 mm longum, lamina anguste rhomboidea, apice rotundata vel leviter emarginata. Alae ca. 15 mm longae, lamina oblongi-elliptica, antice rotundata, basi auriculata, auricula ca. 1,5 mm longa. Carina ca. 14 mm longa, lamina oblique elliptica, ungue lamina sesquilongiore. Ovarium pilosum, breviter stipitatum. Legumen ignotum.

10. Astragalus iranicus group

Plants acaulescent, covered with spreading hairs. Inflorescence cylindrical. Calyx tubular, the teeth subulate. Flowers yellow. Standard obovate. Pods ovate, densely lanate, mixed with short spreading hairs.
Astragalus iranicus, A. ghoortapacensis, A. perdurabilis.

24. Astragalus iranicus Bunge in Mém. Acad. Imp. Sci. Saint Petersbourg 11 (16): 6. 1868 in (1872). **Syntypes:** prope Scharud V.1868, *Bunge & Bienert* (FI!, K!); pr. Sof, Tehran, *Bunge & Bienert*; prope Asadbar et Paskaleh, *Kotschy 297* (W!).
= *A. griseus* Boiss. var. *viridis* Parsa, Fl. Iran 9: 36. 1966. **Typus:** W. Golpayegan, 4.5.1957, *Parsa* ? (K) non vidi.
= *A. ahouicus* Parsa, Fl. Iran 9: 33. 1966. **Typus:** W. Golpayegan, 4.5.1957, *Parsa* ? (K) non vidi.
= *A. chrysotrichus* Boiss. f. *lineatus* Parsa, Fl. Iran 9: 36. 1966. **Typus:** N.W. Azarbayejan, Khalkhal, 16.7.1956, *Parsa* ? (K) non vidi.

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 75 (habit); - page 222 (flower dissection).

Plants ca. 10-25 cm tall, acaulescent or with a short stem up to 5 cm long. Stipules ca. 8-10 mm long, lanceolate, covered with white hairs or mixed with black hairs, at a length of ca. 4 mm adnate to the petiole. Leaves ca. 7-12 cm long, petiole ca. 3-4.5 cm long, both petiole and rachis covered with long scattered hairs, mixed densely with short spreading hairs. Leaflets 11-13 pairs, oblong or elliptic, ca. 8-12 mm long and 3-5 mm broad, both sides covered with appressed hairs. Inflorescence a spike with numerous flowers, at first conical, then elongating, becoming cylindrical in fruit; peduncle ca. 5-11 cm long, covered with long scattered hairs and fine short spreading hairs. Pedicel nearly absent. Calyx ca. 12-13 mm, covered with white hairs or mixed with black hairs at the teeth, the teeth ca. 4 mm long. Corolla yellow. Standard ca. 22 mm long, the limb obovate elliptic. Wing-petals ca. 20 mm long, the limb elliptic, round tipped, at the base auriculate, claw ca. 1.5 times longer than the limb. Keel ca. 18 mm long, the limb oblique-elliptic or slightly curved, 1/2 times shorter than the claw. Pods sessile or shortly stipitate,ovoid, ca. 11 mm long and 4 mm broad, at the apex shortly acuminate, terminating in a beak, ventrally carinate, dorsally sulcate, covered with long, soft, white hairs mixed with short spreading hairs, fully bilocular. Seeds 4.

Notes: Analysis on the type material showing the obovate-elliptic standard limb (not rhomboid) make this species easily separable from *A. mollis* M.Bieb., with which it was combined in former times.

Specimens seen:

Tehran: On the road to Karadj, in Botanic Garden, 1320 m, 20.6.1974, *Mansur Moaied & Amini 12570* (TARI); Vardavard valley, 1800 m, 27.5.1974, *Wendelbo, Sanii & Assadi 11471* (TARI); Mountains N.W. of Tehran, Sulughum valley, 1600 m, 1.5.1979, *Assadi, Mozaffarian & Nowroozi 33676* (TARI); Between Tehran and Karaj, Kuh-e Garm-darreh, 1700 m, 8.5.1979, *Assadi, Mozaffarian & Nowroozi 3357* (TARI); Mountains E of Karadj, 1700 m, 23.5.1979, *Assadi et al 32597* (TARI); Karadj, above Valian, 2000 m, 16.5.1978, *M. Assadi et al 32547* (TARI); W of Tehran, Sulughun valley, 1500-2000 m, *M. Assadi & V. Mozaffarian*, 31.6.1979 (TARI); Chitgar, 1350 m, 24.5.1972, *M. Riazi 6127* (TARI); Arak to Mahallat, late-dar, Mate-dar Mts., 2100-2500 m,14.6.1984, *Mozaffarian & Maassoumi 47963, 47961* (TARI); Between Arak and Khomein, arche village, 2050 m, 15.6.1984, *Mozaffarian & Maassoumi 48020* (TARI); Sorkhe-Hesar, Haraz road, 1530 m, 3.6.1974, *Foroughi, Sanii, Moayed & Amini 12470* (TARI); 15 km W d'Arak, 2050 m, 7.6.1959, *H. Pabot 1199 (28551)* (TARI); Homand, 29.5.1965, *H. Pabot 28554* (Tari); Ibid. 29.5.1966, *Pabot 31106* (TARI); Northern part of Tehran, 1200 m, 7.5.1961, *Zohary & Orshan 14* (HUJ).

Khorassan: N slope of Torbat-e Sefid, 1700-2000 m, 29.5.1977, *Runemark & Sardabi 23802* (TARI).

Fars: Cahar dongeh, 22.5.1965, *Ledingham & Asefi 23685* (Tehran University)

Azarbayejan: 6 km Mianeh, 1000 m, 19.5.1960, *H. Pabot 3328 (28558)* (TARI); 15 km from Zanjan on the road to Bijar, 1900, 30.5.1974, *Wendelbo, Assadi & Shirdelphur 11873, 11853* (TARI); 50-60 km to Zanjan from Mianeh, 1200 m, 1.6.1978, *Wendelbo & Assadi 28041* (TARI).

25. Astragalus ghoortapacensis Maassoumi in Mitt. Bot. Staatss. München 29: 504. 1990.
Holotype: Esfahan, Semiron, Ghoortapacy , 2500 m, 14.6.1986, *M. Nowroozi 4307* (TARI!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 68 (habit); - page 221 (indument of peduncle and pods) and 224 (flower dissection).

Plants acaulescent, ca. 12-14 cm tall. Stipules triangular, ca. 2-3 mm long, pilose, at the base shortly adnate to the petiole and jointed to one another. Leaves 6-8 cm, petiole ca. 1,5-2 cm long, both petiole and rachis covered with black and white appressed hairs. Leaflets 13-15 pairs, ovate or oblong, rounded at the tip or emarginate, both sides with appressed hairs. Inflorescence capitate, ovoid or cylindric, flowers numerous. Bracts subulate, ca. 3-5 mm long, covered with black and white hairs. Calyx tubular, ca. 15 mm long, with some parallel purplish veins, densely covered with black and white spreading hairs, the teeth linear, ca. 3-4 mm long. Corolla yellow. Standard unknown. Wing-petals 20 mm long, the limb oblong-elliptic, asymmetrically notched at the tip, at the base auriculate, auricle ca. 1 mm long. Keel 16 mm long, the limb oblique-elliptic, curvate. Ovary pilose, stipitate. Pods with a stipe ca. 1 mm long, ovoid or ellipsoid, ca. 15 mm long and 5 mm broad, at the apex rostrate, ventrally rounded and slightly carinate, dorsally rounded, sulcate, densely lanate, mixed with short hairs, fully bilocular.

Specimen seen:

Esfahan: Semiron, Ghoortapacy, 2500 m, 14.6.1986, *M. Nowroozi 4307* (TARI).

26. Astragalus perdurabilis Maassoumi sp. nov.
Holotypus: Gorgan: Shah-Passand to Shahroud, south side of Pass Gardaneh Kosh-Yeilagh, 1800 m, 22.6.1974, *Wendelbo & Foroughi 12872* (TARI; Iso: Herb. PODLECH).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 89 (habit); - pages 221 (indument of peduncle and pods) and 224 (flower dissection).

Differs from *A. iranicus* Bge. by the many-flowered cylindric inflorescences, the calyx ca. 16-17 mm long, shortly inflated, (not 12-13 mm long, tubular) and the setaceous calyx teeth, 6-7 mm long (not 3-4 mm).

Plantae perennes, acaules, ca. 12-13 (-17) cm alta. Stipulae lanceolatae ca. 7-8 mm longae, dense albi-pilosae, basi per 3-4 mm petiolo adnatae, inter se connatae. Folia ca. 9-12 cm longa, petiolo ca. 2 cm longo, sicute rachis dense longe et brevissime patenter albi-piloso. Foliola ca. 10-12 juga, oblonge elliptica, ca. 11 mm longa et 5-6 mm lata, complicata, utrinque subappresse vel patenter pilosa. Inflorescentia solitaris, multiflora, dense cylindrica vel elongati-capitata, pedunculo 4-7 cm longo, dense longe et brevissime patenter albi-pilosa. Bracteae lineares, ca. 5 mm longae, albi-pilosae. Calyx tubulosus, basi manifeste inflatus, ca. 17 mm longus, albi-pilosus, dentibus setaceis, ca. 6-7 mm longis. Corolla flava, deinde violacea. Vexillum 19 mm longum, lamina obovata vel elliptica, antice retusa, in medio breviter constricta. Alae ca. 17 mm longae, lamina elliptica, ca. 7 mm longa, antice rotundata, basi auriculata, auricula ca. 1 mm longa, ungue lamina sesquilongiore. Carina 16 mm longa, elliptica, curvata, antice acuta, ungue lamina longiore. Ovarium pilosum, stipitatum. Legumen stipite ca 1 mm longo suffultum, ovoideum, ca. 9 mm longum et 4 mm altum, apice rostratum, rostro curvato, ventro rotundati-carinatum, dorso rotundati-sulcatum, dense lanatum pilis brevissimis albis patentibus immixtis, complete biloculare, oligospermum.

Other specimens seen:

Semnan: Shahrud, Chehheldokhtar, 1850 m, *Riazi 6134* (TARI).
Khorasan: Neishabour, Delbaran, 1400 m, *Foroughi 5872* (TARI).

11. Astragalus glochidiatus group

Plants acaulescent, leaflets linear. Inflorescence densely capitate. Standard limb ovate-oblong. Bracts linear.
Astragalus glochidiatus

27. Astragalus glochidiatus Maassoumi in Iran. J. Bot. 5: 13. 1991. **Holotype:** Kordestan, Bijar, Kuh-e Hamzeh-Arab, 2000-2600 m, 1.7.1971, *Termeh* (s.n.) (Evin!; Iso: W!).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran. 2: plate 67 (habit); - pages 219 (indument of peduncle and pods) and 224 (flower dissection).

Plants acaulescent, ca. 10 cm tall. Stipules lanceolate, acuminate, ca. 12 mm long, glabrous to ciliate at the margin, at a length of ca. 5 mm adnate to the petiole ond jointed to one another. Leaves ca. 7-8 cm long, petiole ca. 3-3,5 cm long, both petiole and rachis glabrous or rarely covered with short hairs. Leaflets ca. 5-6 pairs, linear-lanceolate, complicate, ca. 15 mm long and 2 mm broad, both sides covered with appressed hairs. Inflorescence solitary with numerous flowers in a dense head; peduncle ca. 6-9 cm long, glabrous or with some scattered, spreading hairs. Bracts lanceolate, ca. 5-7 mm long, covered with black and white hairs. Calyx tubular, ca. 12-14 mm long, with black and white hairs. Corolla yellow, changing to violet. Standard ca. 20 mm long, the limb ovate-oblong, retuse at the apex , at the base constricted into a claw. Wing-petals ca. 18 mm long, the limb narrowly elliptic, rounded at the apex, at the base auriculate, auricle ca. 1 mm long, the limb 1/2 length of the claw. Keel ca. 16 mm long,

the limb triangular-curvate, acute at the tip. 1/2 length of the claw. Ovary pilose, shortly stipitate. Pods elliptic, ca. 12 mm long and 4-5 mm broad, ventrally rounded and slightly carinate, dorsally deeply sulcate, densely white lanate, fully bilocular.

Specimen seen:

Kordestan: Bidjar, Kuh-e Hamzeh-Arab, 2000-2600 m, 1.7.1971, *Termeh s.n.* (EVIN, W).

12. Astragalus mollis group

Plants acaulescent or shortly caulescent. Leaflets glabrous above or with some scattered hairs, with lower side densely appressed-hairy. Flowers yellow or violet.
Astragalus mollis, A. memnonius, A. typhaeformis, A. takhtadzhani, A. khajiboulaghensis, A. belgheisicus, A. leucothrichus, A. alamouticus, A. pseudoantilibanii, A. birangae, A. suluklensis.

28. Astragalus mollis M.Bieb., Fl. Taur.-Cauc. 3: 495. 1819 ≡ *A. eriocarpus* M.Bieb., Fl. Taur.-Cauc. 2: 196. 1808 non DC. **Type:** Iberia, circa Tiflin, *Steven* (W!).
= *A. comosus* Bunge in Mém. Acad. Imp. Sci. Saint Petersbourg 11 (16): 55. 1868 in clave etl.c. 15 (1): 93. 1869. **Syntypes:** Persia, in alpinis prope Ask, ad radices Demavand, *Th.Kotschy 852* (W!); Urmia, *Szovits* (non vidi).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 85 (habit); - pages 218 (indument of peduncle and pods) and 224 (flower dissection).

Plants acaulescent, ca. 19 cm tall. Stipules lanceolate acuminate, ca. 4-8 mm long, densely appressed hairy, with some parallel veins, at the length of 2-3 mm adnate to the petiole and jointed to one another. Leaves ca. (6-) 10-17 cm long, petiole ca. (2-) 3-6 cm long, both petiole and rachis covered with short appressed hairs mixed with some isolated long hairs. Leaflets ca. 10-13 pairs, oblong-elliptic, ca. 6-15 mm long and 3-7 mm broad, upper side glabrous or with some scattered long hairs toward the margin, lower side densely covered with long appressed hairs. Inflorescence axillary, oblong or elliptic: peduncle ca. 7-11 cm long, sulcate, covered with short appressed hairs or mixed with some isolated long hairs. Bracts linear-lanceolate, ca. 4-6 mm long, with black and white hairs. Calyx tubular, ca. 10-12 mm long, covered with black and white hairs, the teeth subulate ca. 3-4 mm long. Corolla yellow. Standard ca. 20-24 mm long, the limb rhomboid, ca. 7-10 mm broad, emarginate at apex. Wing-petals ca. 17-22 mm long, the limb elliptic, dilated toward the apex, at the base auriculate, auricle ca. 2 mm long, the limb equaling the claw. Keel ca. 15-20 mm long, the limb narrowly elliptic, curvated toward apex. Ovary pilose, shortly stipitate. Pods ellipsoid, ca. 12-13 mm long and 5-6 mm broad, at apex with a recurved, ca. 4 mm long beak, ventrally slightly carinate, dorsally deeply sulcate, densely covered with long hairs, mixed with short spreading hairs, fully bilocular.

Specimens seen:

Azarbayejan: Inter Marand at Sufian, 1600-1750 m, *Rechinger 41275* (W);13 km S. of Mianeh, 970 m, 19.5.1960, *Pabot s.n.* (TARI); Ardebil, Sabalan mts., Shabil region, 2400-2700 m, 24.6.1986, *Maassoumi & Abouhamzeh 56957* (TARI).

Kordestan: Salwat-Abad pass, SE of Sanandaj, 1480-1950 m, 7.5.1989, *Fattahi & Khaledian 1057* (TARI).

Tehran: Enter Gach-i Sar et Chalus, 3000 m, 18.5.1956, *Schmid 5772* (TARI); N of Sad-e latyan, 1800 m, 16.5.1973, *Arazm & Bazargan 15009* (TARI); 5 km N of Karaj, *Ledigham 4066* (TARI); In mont Pic kuh, *Rechinger 59054* (W); Arak, Khan-e Miran, Sefid Khany mt., 2100-2300 m, *Mozaffarian & Maassoumi 47794* (TARI); Djadjroud, 1700 m, *Arazm & Bazargan 15644* (TARI); Karaje, above Valian, 2000 m, *Assadi & al. 33378* (TARI); Chalus road, before Adarna, 1900 m, 13.5.1985, *Khatamsaz, Maassoumi & Abouhamzeh 52107* (TARI); Karaj valley, Sirachal, 1850 m, 23.5.1974, *Wendelbo & Shirdelpur 11637* (TARI); Between Arak and Khomain, Varche, 2600 m, *Mozaffarian & Maassoumi 48060* (TARI).

Hamadan: Avadj-Sultan-Bulagh, mts. 2000-2400 m, 12.5.1987, *Maassoumi & Mirhosseini 59391* (TARI).

Zanjan: 13 km S Mianeh, 1000 m, 19.5.1960, *Pabot 3370* (TARI); Zanjan to bijar, 1400 m, *Sabeti 15333* (TARI); from Zanjan to Mahneshan, 12 km after Andabad, 2200 m, *Maassoumi 64791* (TARI).

Mazandaran: Enter Amol et Siavicheh, 500-1100 m, 21.5.1956, *Schmid 5868*; Damavand area, 2100 m, 14.5.1959, *Wendelbo 720* (K); Haraz road, Ab-Garm, 2700 m, *Maassoumi 55132* (TARI).

29. Astragalus memnonius Maassoumi & Podlech in Iran. J. Bot. 4: 81. 1988. **Holotype:** Hamadan, Neiridj, near Avadje, 1600 m, 13.5.1974, *Dini & Bazargan 8572* (TARI!).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 84 (habit); - pages 220 (indument of peduncle and pods) and 224 (flower dissection).

Plants ca. 20-22 cm tall, covered with white hairs or with mixed black and white hairs. Caudex branched, stems ca. 4-6 cm long with short internodes, covered with white appressed hairs. Stipules ca. 3-5 mm long, membranous, covered with black and white hairs, at a length of ca. 1 mm adnate to the petiole and shortly jointed to one another. Leaves ca. 4-8 cm long, petiole 1-1.5 cm long, both petiole and the rachis covered with white hairs or mixed with black and white spreading hairs. Leaflets 10-15 pairs, oblong or obovate or obcordate, ca. 4-8 mm long and 2-4 mm broad, at the apex emarginate, upper side sparsely and lower side densely covered with soft appressed hairs. Inflorescence subterminal, a dense raceme ca. 3-8 cm long with numerous flowers; peduncle 6-8 mm long, with white subpatent hairs, below the spike mixed with black and white hairs. Bracts greenish, linear, ca. 6-10 mm long, pedicel nearly absent. Calyx 14-16 mm long, tubular and slightly inflated, covered with white hairs or mixed with black and white spreading hairs, the teeth subulate, ca. 4 mm long. Corolla pink greenish. Standard ca. 23 mm long, the limb rhomboid elliptic, at the apex shortly emarginate, at the base cuneate, near the claw shortly constricted. Wing-petals ca. 19 mm long, the limb oblong, round-tipped, at the base auriculate, auricle ca. 1-1.5 mm long, claw 1.5 times longer than the limb. Keel ca. 17 mm long, the limb oblong, recurved at the acute apex, at the base auriculate, claw 1,5 times longer than the limb. Ovary pilose, stipitate, stipe ca. 1 mm long. Pods unknown.

Specimen seen:

Hamadan: Neiridj near Avadje, 1600 m, 13.5.1974, *Dini & Bazargan 8572* (TARI).

30. Astragalus typhaeformis Maassoumi in Iran. J. Bot. 4: 141. 1988. **Holotype:** Mazandaran: Lar Valley, 2450-2550 m, 2.7.1974, *Wendelbo & Assadi 13372* (TARI!).

Fig.: MAASSOUMI, A.A., 1988. l.c.: 142 (habit); 1990, Illustr., guide gen. Astrag. Iran 1: plate 94 (habit); - pages 221 (indument of peduncle and pods) and 224 (flower dissection).

Plants acaulescent or caulescent, up to 35-40 cm tall, stem up to 20 cm long. Stipule ovate, acuminate, ca. 5-7 mm long, at a length of 2-3 mm adnate to the petiole and jointed to one another, densely covered with black and white hairs. Leaves ca. 15-20 cm long, petiole 4-5 cm long, both petiole and rachis densely covered with spreading white hairs. Leaflets 18-20 pairs, elliptic or narrowly ovate, ca. 10-13 mm long and 3-4 mm broad, retuse tipped, at the base cuneate, upper side covered with scattered hairs toward the margin or glabrous, lower side vested with spreading hairs. Inflorescence axillary, a cylindric, dense spike, ca. 15 cm long: peduncle sulcate, ca. 15 cm long, covered with patent hairs or glabrous. Bracts linear, green, ca. 7-8 mm long, with black and white hairs. Calyx tubular, at the base slightly gibbous, ca. 14 mm long, covered with black and white hairs, the teeth subulate, ca. 4-5 mm long. Corolla initially yellow, then turning brownish. Standard ca. 21 mm long, the limb rhomboid, at the middle part ca. 9 mm broad, emarginately tipped or bilobate, at the base abruptly constricted. Wing-petals ca. 18 mm long, the limb elliptic, ca. 7 mm long, round-tipped, at the base auriculate, auricle ca. 1,5 mm long, 1/2 length of the claw. Keel ca. 17 mm long, the limb oblique elliptic, recurved, shorter than the claw. Ovary pilose, stipitate. Pods with a stipe ca. 1 mm long, oblong-oval or ellipsoid, ca. 11 mm long and 5 mm broad, terminating in a recurved beak, ventrally carinate, dorsally sulcate, densely covered with white long hairs mixed with short spreading hairs, fully bilocular. Seeds 4, reniform, ca. 3 mm long and 2,5 mm broad, alveolate.

Specimens seen:

Mazandaran: Lar valley, 2450-2550 m, *Wendelbo & Assadi 13254, 13323* (TARI); Lar valley,below Rudkhaneh Abru (Sefid Ab), 2300 m, *P. Wendelbo 11830* (TARI); Haraz road, E. of Polur, 7 km to Ab-Ask, 2100 m, 19.5.1988, *Runemark & Mozaffarian 28221* (TARI); Ibidem, 3.6.1976, *Maassoumi 55133* (TARI); Ibidem, *Babakhanlou & Amin 22060* (TARI).

Tehran: 35 km to Firouz-kuh on the road from Damavand, 2080 m, *Assadi & Mozaffarian 35313* (TARI).

31. Astragalus takhtadzhani Grossh. in Fl. USSR 12: 886. 1946. **Holotype:** in viciniis urb. Erevan prope pag. Dzhervesch, 12.5.1922, *A. Grossheim* (BAK) non vidi.

Fig.: MAASSOUMI, A.A., 1993, Illustr., guide gen. Astrag. Iran 2: plate 100 (habit); - pages 218 (indument of peduncle and pods) and 224 (flower dissection).

Plants acaulescent or with well developed stem, ca. 5-10 cm tall. Stipules ca. 8-10 mm long, covered with white hairs, acute, linear-lanceolate, at a length of ca. 2 mm adnate to the petiole. Leaves ca. 12-15 cm long, petiole 3-5 (-8) cm long, sulcate, both petiole and rachis covered with short appressed hairs or glabrous. Leaflets 14-16 pairs, elliptic, ca. 12 mm long and 4 mm broad, upper side glabrous and lower side with some isolated hairs or glabrous. Inflorescence a dense spike with numerous flowers; peduncle ca. 5-10 cm long. Pedicel nearly absent. Bracts linear, ca. 15-20 mm long, covered with black and white hairs. Calyx tubular, ca. 15-16 mm long, covered with black and white hairs, the teeth setaceous, ca. 4-5 mm long. Corolla yellow. Standard ca. 24 mm long, the limb rhomboid, ca. 9 mm broad, towards the apex ligulately attenuate, incised, at the base near the claw constricted. Wing-petals ca. 21 mm long, the limb narrowly elliptic, round-tipped, at the base auriculate, claw equaling the limb or slightly longer. Keel ca. 19 mm long, the limb oblique-elliptic, claw two times longer than the limb. Ovary pilose, sessile. Pods sessile, ovoid, ca. 12 mm long and 4 mm broad, at the apex ending in a beak, covered with long silky white hairs, bilocular.

Specimens seen:

Azarbayejan: Jolfa, 18 km, Marand road, 1190 m, 12.6.1972, *Foroughi 6285* (TARI); 27 km from Khalkhal to Kivi, 1500-1650 m, 16.6.1980, *Mozaffarian & Nowroozi 34174* (TARI); 19 km from Khalkhal to Kivi, Anavis village, 1680 m, 16.6.1980, *Mozaffarian & Nowroozi 36164* (TARI); 13-18 km SE Mianeh, 1200 m, 6.5.1971, *Rechinger 39354* (W).

32. Astragalus khajiboulaghensis Maassoumi in Mitt. Bot. Staatssamml. München, 29: 505. Aje-Boulagh, 1950 m, 21.6.1980, *Mozaffarian & Nowroozi 34683* (TARI!).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 77 (habit); - pages 221 (indument of peduncle and pods) and 224 (flower dissection).

Plants acaulescent, ca. 5-9 cm tall with a divided caudex. Stipules ca. 3-4 mm long, ovate, pilose, at a length of ca. 1 mm adnate to the petiole and jointed to one another. Leaves 3-5 cm long, petiole ca. 0,5-1,5 cm, both petiole and rachis covered with long and short white spreading hairs. Leaflets ca. 15 pairs, narrowly elliptic, ca. 4 mm long and 1-2 mm broad, rounded, upper side glabrous, lower side covered with subappressed hairs. Inflorescence axillary, flowers numerous in dense head, elongating in fruit; peduncle ca. 3-3.5 cm long, covered with subappressed hairs, toward the inflorescence mixed with black hairs. Bracts linear-lanceolate, ca. 8-9 mm long, with black and white hairs. Flowers nearly sessile. Calyx tubular, ca. 15 mm long, densely covered with black and white hairs, the teeth linear, ca. 5-7 mm long. Corolla yellow. Standard ca. 19 mm long, the limb narrowly rhomboid, ca. 6 mm broad, at the apex emarginate. Wing-petals ca. 16 mm long, the limb narrowly elliptic, rounded at the apex, at the base auriculate, auricle rounded, ca. 1,5 mm long, the claw 2 times longer than the limb. Keel ca. 15 mm long, the limb oblique-elliptic, rounded at the apex, nearly equaling the claw. Ovary pilose. Pods shortly stipitate, ovoid, ca. 10 mm long and 4-5 mm broad, rostrate-tipped, ventrally rounded, dorsally deeply sulcate, densely lanate, fully bilocular.

Specimen seen:

Azarbayejan: 60 km from Namin to Khaje-Boulagh, above Khaje-Boulagh, Aje-Boulagh, 1950 m, 21.6.1980, *Mozaffarian & Nowroozi 34683* (TARI).

33. Astragalus belgheisicus Maassoumi in Iran. J. Bot. 5: 10. 1991. **Holotype:** Zanjan, Mahneshan, Anguran, Belgheis mts., 2700-2900 m, 29.5.1987, *Maassoumi 64843* (TARI!).

Fig.: MAASSOUMI 1993, Illustr. guide gen. Astrag. Iran 2: plate 58 (habit); - pages 219 (indument of peduncle and pods) and 224 (flower dissection).

Plants acaulescent, ca. 10-12 cm tall. Stipules triangular-lanceolate, pilose, ca. 4-5 mm long, at a length of ca. 1-1,5 mm adnate to the petiole and jointed to one another. Leaves ca. 7-8 cm long, petiole ca. 1,5-2 cm long, both petiole and rachis densely covered with spreading hairs. Leaflets ca. 12-13 pairs, oblong-elliptic, obtuse or retuse, ca. 8-10 mm long and 3-5 mm broad, upper side glabrous, lower side covered with subappressed hairs. Inflorescence capitate, ovoid, flowers numerous; peduncle ca. 5-7 cm long, covered with spreading hairs, toward the inflorescence mixed with black hairs. Bracts linear-lanceolate, ca. 7-8 mm long, densely covered with black and white hairs. Calyx tubular, inflated at the base, ca. 15 mm long, densely covered with white lanate hairs, mixed with short black hairs, the teeth linear, ca. 4-5 mm long.

Corolla yellow. Standard ca. 22 mm long, the limb rhomboid, ca. 9 mm broad, emarginate at the apex. Wing-petals ca. 18 mm long, the limb elliptic, at the apex rounded, at the base auriculate, auricle ca. 2 mm long, the limb nearly equaling the claw. Keel ca. 16 mm long, the limb triangular, curvate, the claw 2 times longer than the limb. Ovary pilose, sessile. Pods ca. 8 mm long, ca. 3-4 mm broad, densely lanate.

Specimens seen:

Zanjan: Mahneshan, Anguran, Belgheis mts. 2700-2900 m, 25.4.1987, Maassoumi 64842 (TARI); ca. 34 km from Gilvan to Zanjan, N slope of Alburz rangs, 1600 m, 6.5.1987, *Assadi & Shah-Mohammadi 60301* (TARI).

Hamadan: Avadje, Sultan-Bulagh mts. 2000-2400 m, 12.5.1987, *Maassoumi & Mirhosseini 59394* (TARI).

Azarbayejan: Khalkhal to Ardabil, 35 km Khalkhal, 1400-1700 m, 24.5.1974, *Termeh & Moussavi 16481* (Evin).

34. Astragalus leucotrichus Maassoumi sp. nov.

Holotypus: Kordestan: Elevations of Abbedar, 5 km from Sanandaj, 1750-1850 m, 9.5.1986, *Fattahi & Khaledian 1026* (TARI!).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 79 (habit); - pages 220 (indument of peduncle and pods) and 224 (flower dissection).

Differs from *A. galbineus* Maassoumi by the limb of wing-petals rounded at apex (not emarginate), upper side of the leaflets glabrous or with some subpatent hairs toward the margin only (not completely covered with appressed hairs); from *A. idoneus* Maassoumi & Podlech by much shorter calyx teeth, the peduncle covered with white subpatent and long black spreading hairs (not only with white appressed hairs); from *A. belgheisicus* Maassoumi by flowers dark violet (not yellow) and calyx teeth 2 mm long (not 5-6 mm).

Plantae perennes, breviter caulescentes, ca. 17 cm altae. Stipulae ovati-lanceolatae, inferiores appresse albi-pilosae, superiores nigri-pilosae, ca. 4-8 mm longae, basi per 2 mm petiolo adnatae, inter se connatae. Folia 9-11 cm longa, petiolo (1-) 2-4 cm longo, cum rachide dense pilis albis nigrisque subpatentibus aequilongis obtecto. Foliola ca. 15 juga, oblongi-elliptica, apice obtusa, 4-9 mm longa et 2-4 mm lata, supra glabra vel marginem versus pilosa, subtus dense subappresse pilosa. Inflorescentiae in axillis foliorum superiorum, pedunculo 7-10 cm longo, dense patule brevissime albi- et longe nigri-piloso. Bractae lanceolatae, ca. 7-9 mm longae, dense rigide nigri- pilosae. Calyx tubulosus, ca. 12-13 mm longus, albi-nigri-pilosus, dentibus subulatis, 2-3 mm longis. Corolla violacea (in sicco). Vexillum ca. 19 mm longum, lamina rhomboida, ca. 9 mm lata, antice emarginata vel biloba. Alae ca. 16 mm longae, lamina oblonga, apicem versus dilatata, antice rotundata, basi auriculata, auricula ca. 2 mm longa, ungue laminam aequantes. Carina ca. 15 mm longa, lamina elliptica. Ovarium pilosum. Legumen ignotum.

Other specimen seen:

Kordestan: Sanandaj, slope of Abidar, 1700 m, *Fattahi 2296* (TARI).

35. Astragalus alamouticus Maassoumi sp. nov.

Holotypus: Tehran, Ghazvin, Alamout, near the village Evan (VA4), 2000 m, 9.7.1984, *Assadi & Maassoumi 51047* (TARI!).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 56 (habit); - pages 221 (indument of peduncle and pods) and 224 (flower dissection).

Differs from *A. idoneus* Maassoumi & Podlech by upper side of the leaflets glabrous (not hairy), standard limb rhomboid (not ovate-oblong) and by the pods covered with long hairs only (not mixed with short spreading hairs); from *A. leushanensis* Maassoumi by the rhomboid (not oblong-elliptic) standard.

Plantae perennes, ca. 5-11 cm altae, breviter caulescentes, caules ca. 1-1,5 cm longi, dense appresse vel subappresse albi-pilosi. Stipulae lanceolatae, ca. 3-5 mm longae, atripurpureae, appresse pilosae, per ca. 1 mm petiolo adnatae, inter se connatae. Folia ca. 3-6 cm longa, petiolo ca. 1-1,5 cm longo, sicut rachis pilis brevissimis appressis albis et longioribus appressis ad subpatentibus vel patentibus albis et nigris obtecto. Foliola 12-13 juga, oblongi-elliptica vel obovata, apice emarginata, 3-7 mm longa et 2-3 mm lata, supra glabra, margine sparse ciliata, subtus imprimis in costa mediana appresse pilosa. Inflorescentia solitaris, pedunculo 3-5 cm longo, sicut rachis piloso suffulta. Bracteae lineares, ca. 12-15 mm longae, lineari-lanceolatae, subappresse albi-nigri-pilosae. Calyx tubulosus, leviter inflatus, ca. 12-13 mm longus, longe albi- hirsutus pilis brevissimis nigris immixtis, dentibus linearibus, ca. 4 mm longis. Corolla flava. Vexillum ca. 18 mm longum, lamina rhomboida, in medio ca. 5,5 mm lata, antice profunde emarginata vel biloba, basi in unguem abrupte contracta. Alae ca. 15 mm longae, lamina anguste elliptica, antice emargina, basi auriculata, ungue lamina paulo longiore. Carina ca. 14 mm longa, lamina elliptica, ungue lamina longiore. Ovarium pilosum, stipitatum. Legumen breviter stipitatum, ellipsoideum, ca. 9 mm longum et 3 mm latum, apice rostro ca. 3 mm longo, ventro carinatum, dorso breviter rotundatum et sulcatum, dense lanatum et insuper pilis brevibus patentibus albis obtectum, complete biloculare.

36. Astragalus pseudoantilibani Maassoumi sp.nov.

Holotypus: Azarbayejan: 14 km from Naim to Chulandarreh, Sofla to Germi, after Anbaran, 1600 m, 20.6.1980, *Mozaffarian & Nowroozi 34491* (TARI!).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 90 (habit); - pages 221 (indument of peduncle and pods) and 224 (flower dissection).

Differs from *A. khajiboulaghensis* Maassoumi by the pods covered with long and short spreading hairs (not only with long hairs); from *A. antilibanus* Bunge by leaflets densely covered with appressed hairs on both sides (not glabrous on upper side) and petiole, rachis and peduncle covered with equal spreading hairs (not with a double indument).

Plantae perennes, acaules, caudex multiceps. Stipulae lanceolatae, ca. 10 mm longae, inferiores in facie glabrae, margine ciliatae, superiores appresse pilosae, basi per 2-3 mm petiolo adnatae, inter se connatae. Folia 11-5 cm longa, petiolo ca. 2,5 mm longo, sicut rachis dense brevissime patule piloso. Foliola ca. 13 juga, anguste elliptica, obtusa vel acuta, ca. 5 mm longa et 2-3 mm lata, utrinque dense appresse pilosa. Inflorescentiae multiflora, capitatae, pedunculo ca. 6-7 cm longo, brevissime patenter albi-piloso, infra capitulum sparse pilis nigris immixtis suffulto. Bracteae lineares, ca. 6-7 mm longae, albi-nigri-pilosae. Calyx tubulosus, ca. 13-14 mm longus, albi-lanatus et insuper pilis nigris brevissimis patentibus obtectus, dentibus linearibus ca. 5 mm longis. Corolla flava. Vexillum ca. 22 mm longum, lamina rhomboida, ca. 8 mm lata, antice retusa vel leviter emarginata. Alae ca. 11 mm longae, lamina oblonga, antice

rotundata, basi auriculata, auricula ca. 2 mm longa, ungue laminam aequante. Carina ca. 17 mm longa, lamina elliptica recurvata, antice acuta, ungue lamina paulo longiore. Ovarium pilosum, breviter stipitatum. Legumen breviter stipitatum, ellipsoideum, ca. 12 mm longum et 4-5 mm latum, apice rostratum, rostro curvato ca. 2 mm longo, ventro late carinatum, dorso rotundatum et sulcatum, dense albi- lanatum et insuper pilis brevissimis patentibus obtectum, complete biloculare.

37. Astragalus birangae Maassoumi in Iran. J. Bot. 5: 10. 1991. **Holotype:** Azarbayejan: Dasht-e Moghan, ca. 160 m, 15.4.1986, *Youssefy 24* (TARI!).

Fig.: MAASOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 59 (habit); - pages 221 (indument of peduncle and pods) and 224 (flower dissection).

Plants acaulescent, ca. 20-30 cm tall, or sometimes caulescent with stems up to 4 cm long. Stipules lanceolate, acuminate, greenish, ca. 7-8 mm long, covered with black and white hairs, at a length of ca. 3 mm adnate to the petiole and shortly jointed to one another. Leaves 20-30 cm long, petiole ca. 8-10 cm long, both petiole and rachis covered with white subappressed hairs. Leaflets ca. 14-15 pairs, the lower ones oblong or ovate-elliptic, the upper narrowly elliptic or linear, ca. (5-) 10-15 mm long and 3-5 mm broad, upper side glabrous or toward the margin with scattered hairs, lower side covered with appressed hairs. Inflorescence capitate with numerous flowers; peduncle ca. 2-2.5 cm long, covered with long spreading hairs mixed with short appressed hairs, toward the inflorescence mixed with black hairs. Bracts subulate or linear, ca. 6-8 mm long. Calyx tubular, ca. 15 mm long, covered with black and white hairs, the teeth linear, ca. 4 mm long. Corolla yellow. Standard ca. 26 mm long, the limb rhomboid, ca. 11 mm broad, emarginate at the apex or bilobed. Wing-petals ca. 23 mm long, the limb oblong, dilated toward the apex, at the tip rounded, at the base auriculate, auricle ca. 2,5 mm long. Keel ca. 23 mm long, the limb triangular, curvate. Ovary sessile, pilose. Pods unkown.

Specimen seen:

Azarbayejan: Dasht-e Moghan, ca. 160 m, 15.4.1986, *Youssefy 24* (TARI).

38. Astragalus suluklensis Freyn et Sint. in Bull. Herb. Boiss., ser. 2, 4: 451. 1904. **Holotype:** Mts. Turkmenistan (Kopet-dagh), Suluklü village, 1.7.1900, *Sintenis 737* (non vidi).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 99 (habit); - pages 218 (indument of peduncle and pods) and 224 (flower dissection).

Plants 20-35 cm tall, shortly caulescent, stems 3-6 cm long. Stipules lanceolate, 15-18 mm long, pilose, at the base adnate to the petiole. Leaves 10-20 cm, petiole and rachis densely covered with short, spreading, stiff hairs. Leaflets 10-14 pairs, elliptic or oblong, 7-15 mm long and 4-10 mm broad, upper side scattered and lower side densely hairy. Inflorescence a dense, long cylindrical spike, 5-12 cm long; peduncle 10-17 cm long with stiff spreading hairs. Calyx tubular, 18-22 mm long, covered with white hairs or mixed with black and white hairs. Corolla violet. Standard 20-24 mm long, the limb rhomboid, ligulate-attenuate toward the apex. Wing-petals 15-20 mm long, the limb elliptic, slightly dilated towards the apex. Keel shorter than the wings, 14-19 mm long, the limb oblique-elliptic. Ovary pilose. Pods sessile, ovoid, 7-11 mm long and 5-7 mm broad, ventrally carinate, dorsally sulcate, the apex with a curved beak 2-3 mm long, densely villous, bilocular.

Specimens seen:

Khorassan: 68 km on the road to Gifan from Bojnoord, after Amir-Abad, 1200 m, *Assadi & Maassoumi 50305, 50260* (TARI), ca. 25 km Sw of Darreh-Gaz, Tandooreh National Park, Chehel-Mehr, 1200 m, *Assadi & Maassoumi 50756* (TARI), ca. 30 km N of Shirvan, near Sevaldi, 1600 m, *Assadi & Maassoumi 50372* (TARI).

13. Astragalus canosus group

Plants acaulescent, whole plant densely villous. Corolla yellow. Standard rhomboid. Pods densely long-lanate.
Astragalus canosus.

39. Astragalus canosus Maassoumi in Iran. J. Bot. 5: 12. 1991. **Holotype:** Azarbayejan: Rezaiyeh, hill by the lake, just North of Golman-Khaneh, 1400 m, 1.6.1974, *Wendelbo, Assadi & Shirdelpur 11981* (TARI!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 61 (habit); - pages 220 (indument of peduncle and pods) and 224 (flower dissection).

Plants ca. 15 cm tall, acaulescent or with short stems ca. 1-1,5 cm long, densely covered with lanate hairs, caudex divided. Stipules covered with black and white hairs, ca. 5-6 mm long, at a length of 3-4 mm adnate to the petiole, shortly jointed to one another. Leaves ca. 12 cm long, petiole ca. 3-4 cm long, both petiole and rachis densely covered with spreading white long hairs mixed with black hairs. Leaflets ca. 11-13 pairs, ovate-elliptic, both sides densely villous, ca. 7-9 mm long and 3-6 mm broad. Inflorescence capitate to ovate, flowers numerous; peduncle ca. 8-9 cm long, densely covered with long white and short black and white spreading hairs, toward the inflorescence merely with black hairs. Bracts linear, ca. 4 mm long, covered with black and white hairs. Calyx tubular, slightly inflated at the base, 12-13 mm long, covered with long white and short black hairs, the teeth linear, ca. 3 mm long. Corolla yellow. Standard ca. 18 mm long, the limb rhomboid, ca. 7 mm broad, retuse at the apex. Wing-petals ca. 15 mm long, the limb oblong, rounded at the apex, at the base auriculate, auricle ca. 1,5 mm long, the limb shorter than the claw. Keel ca. 11 mm long, the limb triangular. Pods ovoid ca. 12 mm long and 6 mm broad, densely lanate, at apex rostrate with a the beak ca. 4-5 mm long, ventrally carinate, dorsally sulcate, fully bilocular.

Specimens seen:

Azarbayejan: Rezaiyeh, hill be the lake, just north of Golman-Khaneh, 1400 m, 1.6.1974, *Wendelbo, Assadi & Shirdelpur 11981* (TARI).

14. Astragalus idoneus group

Plants acaulescent, glaucous. Petiole and rachis densely covered with very short, silvery, appressed hairs. Leaflets glabrous above, hairy along the mid-vein on lower side. Standard oblong-elliptic.

Astragalus idoneus, A. leushanensis, A. inoblitus, A. caligineus.

40. Astragalus idoneus Maassoumi & Podlech in Mitt. Bot. Staatss. München 29: 512. 1990.
Holotype: Tehran, Tehran to Karadj, Garm-Darreh, 2200 m, 7.5.1978, *Assadi 27540* (TARI!, Iso. Herb. PODLECH!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 71 (habit); - pages 221 (indument of peduncle and pods) and 224 (flower dissection).

Plants acaulescent, or shortly caulescent, stem up to 2 cm long, densely covered with short appressed hairs 0,3-0,8 mm long. Stipules membraneous, triangular, ca. 2-6 mm long, covered with short, white, appressed hairs or mixed with few black hairs, at a length of 2-3 mm adnate to the petiole, shortly jointed to one another. Leaves 8-12 cm long, petiole ca. 1,5-4 cm long, both petiole and rachis covered with rigid appressed hairs. Leaflets 8-14 pairs, narrowly elliptic, ca. 5-8 mm long and 2-4 mm broad, rounded at the apex or slightly emarginate, upper side covered with scattered hairs, lower side covered more densely with appressed hairs, sometimes complicate. Inflorescence pedunculate with numerous flowers; peduncle ca. 4-8 cm long, at the base densely covered with short hairs, toward the apex mixed with scattered long white or black hairs. Bracts greenish, ca. 10-15 mm long, linear, covered with black and white hairs. Calyx ca. 14-16 mm long, tubular or slightly inflated, covered with long thin hairs, the teeth ca. 5-7 mm long. Corolla yellow, changing to violet. Standard 19-20 mm long, the limb elliptic, ca. 7-8 mm broad, shortly emarginate at the apex. Wing-petals ca. 17 mm long, the limb narrowly elliptic, dilated toward the apex, at the base auriculate, auricle ca. 1 mm long, the limb shorter than the claw. Keel ca. 16 mm long, the limb oblique-triangular-curvate, ca. 6 mm long and 3 mm broad, the claw ca. 10 mm long. Ovary sessile, pilose. Pods sessile, densely covered with long patent hairs mixed with scattered short white hairs.

Specimen seen:

Tehran: Tehran to Karadj, Garm-Darreh, 2200 m, 7.5.1978, *Assadi 27540* (TARI).

41. Astragalus leushanensis Maassoumi sp. nov.
Holotypus: Gilan, 62 km to Rudbar on the road from Ghazvin, 1300 m, 3.5.1987, *Assadi & Shah-Mohammadi 60356* (TARI!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 80 (habit); - pages 220 (indument of peduncle and pods) and 224 (flower dissection).

Differs from *A. idoneus* Maassoumi & Podlech by the calyx teeth ca. 3 mm long (not 6 mm) the peduncle densely covered with short appressed hairs only (not with mixed short and long hairs), the pods covered with long hairs only (not mixed with short spreading hairs); from *A. belgheisicus* Maassoumi by the peduncle with short appressed hairs (not with long and short hairs) and the obovate-oblong (not rhomboid) standard limb.

Plantae perennis, virides, brevissime caulescentes, caule ca. 3-5 cm longo,dense brevissime et longe albi-piloso. Stipulae lanceolatae, ca. 5 mm longae, dense brevissime appresse albi-nigri-pilosae, margine longe ciliatae, basi per 1,5-2 mm petiolo adnatae, inter se connatae. Folia 7-10 cm longa, petiolo 2-3,5 cm longo, cum rachide pilis subapressis albis, sparssime nigris immixtis obtecto. Foliola 13-14 juga, ovati-elliptica vel obovata, basi cunneata, apice retusa vel emarginata, ca. 6-8 mm longa et 2-4 mm lata, supra glabra vel marginem versus sparse pilosa,

subtus in costa mediana pilosa. Inflorescentia solitaris, primo capitata, deinde elongata, pedunculo ca. 5-6 cm longo, basi breviter appresse albi-piloso, capitulum versus albi-nigri-piloso suffulta. Bracteae ca. 8-9 mm longae, lineari-lanceolatae, patenter albi- et nigri-pilosae, margine longe ciliatae. Calyx tubulosus, breviter turgidus, ca. 14-15 mm longus, dense longe albi- et brevissime nigri-pilosus, dentibus linearibus, ca. 4-5 mm longis. Corolla flava (in vivo) demum purpurea. Vexillum ca. 19 mm longum, lamina elliptica, ca. 7 mm lata, antice emarginata. Alae ca. 18 mm longae, lamina anguste elliptica, antice rotundata, basi auriculata, auricula ca. 1 mm longa, ungue laminam aequante. Carina ca. 16 mm longa, lamina elliptica, ungue lamina paulo longiore. Ovarium pilosum. Legumen ignotum.

42. Astragalus inoblitus Maassoumi sp. nov.
Holotype: Azarbayejan, 19-20 km from Ahar to Tabriz, 1600-1700 m, 24.6.1986, *Maassoumi & Abouhamzeh 56963* (TARI!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 74 (habit); - pages 221 (indument of peduncle and pods) and 224 (flower dissection).

Differs from *A. comosoides* D.F.Chamb. & V.A.Matthews by the oblong (not rhomboid) standard limb and the much longer calyx teeth; from *A. macrourus* Fisch. & C.A.Mey. by the much shorter inflorescence and the oblong, toward the apex attenuate (but not ligulate) standard limb and the shortly stipitate pods.

Plantae perennes, acaules, ca. 7-13 cm altae, caudex multiceps. Stipulae lanceolatae, acuminatae, 7-9 mm longae, inferiores glabrae, superiores albi-pilosae, basi per 3-4 mm petiolo adnatae, inter se connatae. Folia 5-10 cm longa, petiolo 1-3,5 cm longo, sicut rachis dense longr et brevissime patenter albi-piloso. Foliola 12-13 juga anguste elliptica, acuta vel acuminata, 6-10 mm longa et 2-3 mm lata, utrinque subappresse pilosa. Inflorescentiae multiflorae, pedunculo (2-) 5-10 cm longo, sicut rachis piloso suffultae. Bracteae lineari-lancolatae, ca. 6-7 mm longae, albi- et nigri-pilosae. Calyx tubulosus, 13-14 mm longus, albi-nigri-pilosus, dentibus linearibus, ca. 4-5 mm longis. Corolla flava. Vexillum ca. 21 mm longum, lamina oblonga, antice retusa vel leviter emarginata. Alae 19 mm longae, lamina anguste elliptica, antice obtusa, basi auriculata, auricula ca. 1,5 mm longa, ungue lamina sublongiore. Carina ca. 17 mm longa, lamina elliptica, antice obtusa, ungue lamina sesquilongiore. Ovarium pilosum, stipitatum. Legumen ignotum.

Other specimens seen:

Azarbayejan: Pass ca. 20 km S of Ahar on the road to Tabriz, 1700-1800 m, 31.5.1978, *Wendelbo & Assadi 27948* (TARI); 20 km to Tehran-Tabriz road on the road from Ahar, 1450 m, 31.5.1978, *Wendelbo & Assadi 28006* (TARI).

43. Astragalus caligineus Maassoumi sp. nov.
Holotypus: Chaharmahal-e Bakhtiari, Lordeghan Monj, Badamestan, Kuh-e Badamestan, N of Bon-e gard, 30.5.1986, 1500-2350 m, *Mozaffarian 54709* (TARI!).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 60 (habit); - pages 221 (indument of peduncle and pods) and 224 (flower dissection).

Species differs from *A. alamouticus* Maassoumi and *A. idoneus* Maassoumi & Podlech by the indumentum of long and short spreading hairs (not short and appressed).

Plantae perennes, ca. 18-20 cm altae, acaules vel breviter caulescentes, caulibus ad 5 cm longis, caudex multiceps. Stipulae lanceolatae, ca. 8 mm longae, albi-nigri-pilosae, margine longe ciliatae, basi per 3 mm petiolo adnatae, inter se connatae. Folia 9-10 cm longa, petiolo 2,5-3 mm longo, sicut rachis longe et brevissime patenter albi-piloso. Foliola ca. 16 juga, glauca, ca. 10 mm longa et 5 mm lata, supra glabra vel marginem versus sparse pilosa, subtus subappresse pilosa. Inflorescentiae axillares, pedunclo ca. 10 cm longo, sict rachis piloso sed apicem versus sparse pilis nigris immixtis suffultae. Bracteae lineares, ca. 7 mm longae, predominante nigri-pilosae. Calyx tubulosus, ca. 14 mm longus, patule albi-nigri-pilosus, dentibus linearibus ca. 4 mm longis. Corolla flava. Vexillum ca. 19 mm longum, lamina rhomboida, ca. 7 mm lata, apicem versus breviter ligulata. Alae ca. 15 mm longae, lamina elliptica, antice rotundata, basi auriculata, auricula ca. 1,5 mm longa. Carina ca. 14 mm longa, lamina oblique elliptica, ungue laminam aequante. Ovarium pilosum, sessile. Legumen breviter stipitatum, ovoideum, ca. 10 mm longum et 4-5 mm latum, apice rostratum, rostro ca. 4-5 mm longo, curvato, ventro carinatum, dorso sulcatum, dense longe et brevissime patenter pilosum, complete biloculare, oligospermum.

Other specimens seen:

Chaharmahal-e Bakhtiari: Lordegan, Monj, Badamestan, Kuh-e Badamestan, N of Bon-e gard, 1500-2350 m, *Mozaffarian 54708* (TARI); Lordegan, Kohian, (protected station of Research Institute), 1710 m, 25.5.1986, *Mozaffarian 54429* (TARI); Shahr-e Kord, Baba-Heidar, 2150-2500 m, *Termeh & Isadyar 40946* (EVIN).

Esfahan: Khonsar to Buin-Miandasht, Kouh-e Hossein-Abad (2700-2900 m), 17.6.1989, *Termeh, Karavar & Tehrani s.n.* (EVIN).

15. Astragalus rawlinsianus group

Plants acaulescent, very rarely caulescent. Leaflets densely hairy. Inflorescence capitate or densely ovate. Bracts linear. Standard limb rhomboid. Flower violet.
Astragalus rawlinsianus.

44. Astragalus rawlinsianus Aitch. & Baker in Trans. Linn. Soc. London, Bot. 3: 51. 1888.
Type: Afghanistan, Badghis, May 1885, *Aitchison 357* (K!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 94 (habit); - pages 218 (indument of peduncle and pods) and 224 (flower dissection).

Plants ca. 12-20 cm tall, usually prostrate at the surface of the soil, sometimes with short stem up to 4 cm long. Stipules pilose, ca. 8 mm long, triangular or lanceolate, abruptly attenuate, at a length of ca. 4 mm adnate to the petiole, distinctly rugose. Leaves ca. 7-9 cm long, petiole ca. 2-3 cm long, both petiole and rachis covered with spreading, long hairs. Leaflets 9-13 pairs, obovate or elliptic, at the apex obtuse or emarginate, 5-10 mm long and 3-6 mm broad, upper side scattered and lower side densely covered with spreading long hairs. Inflorescence capitate or spike-like with numerous flowers; peduncle 9-12 cm long, covered with long silky hairs. Pedicels nearly abscent. Bracts linear, ca. 6-7 mm long, covered with black and white hairs. Calyx pale violet, 8-11 mm long, covered with black and white hairs, the teeth setaceous ca. 3-4 mm long. Corolla violet. Standard ca. 18 mm long, the limb rhomboid, ligulately attenuate toward the apex, ca. 7,5 mm broad, at the base near the claw constricted. Wing-petals ca. 14 mm long, the limb narrowly elliptic, attenuate toward the apex, round-tipped, at the base auriculate, auricle ca. 1,5 mm long, claw slightly shorter than the limb. Keel

ca. 12 mm long, the limb elliptic-oblique, somewhat recurved, claw equaling the limb. Ovary pilose, shortly stipitate. Pods nearly sessile, 7-11 mm long, ventrally carinate, dorsally deeply sulcate, with a long recurved, subulate beak 5-9 mm long, densely villous, fully bilocular.

Specimens seen:

Gorgan: Golestan park; inter Sharlegh and Cehshm-e Khan, 1350 m, *Maassoumi 47548* (TARI); Shah-Passand to Shahroud, South side of pass Gardaneh Kosh-Yeilagh, 1800 m, 22.6.1974, *Wendelbo & Foroughi 12873* (TARI); Golestan Park, inter Sharlegh and Cheshm-e Khan, 1350 m, 7.5.1984, *Maassoumi 47549* (TARI); Golestand Park Sharlegh Station, 1300 m, 8.5.1984, *Maassoumi 47587, 47591* (TARI); Mohammad Reza Shah Wild life Park, near bojnurd road, along to Bekadeh Artemisia-stepp, 1250 m, 2.5.1974, *Wendelbo, Foroughi, Sanii, Shirdelpu 11057* (TARI); Golestan Forest, Almeh, 1600 m, 9.5.1972, *Sabeti 6273* (TARI); 15 km from Maraveh tappeh on the road, to Ashkhaneh, 380 m, 23.4.1986, *Assadi & Massoumi 55580* (TARI); Mohammad Reza-Shah wild life Park, Almeh, 1750 m, *Wendelbo & Foroughi 12654* (W); Bojnurd, Almeh road, 1800 m, 18.5.1972, *Foroughi 6097* (TARI).

Semnan: Shahpassand to Shahrud, after pass, 1800-1950 m, *Wendelbo & Assadi 29688, 29703* (TARI).

Khorassan: Between Ghoochand and Darreh-Gaz, Randooreh National Park, Shakrab, 2300 m, 27.5.1984, *Assadi & Maassoumi 50579* (TARI); Ghuchan, 31 km, Darreh-Gaz road, 1940 m, 27.5.1972, *Foroughi 5876* (TARI); Esferayen, N slope of Kuh-e Shah Jahan from Darpachin-e bala village, 1700-2500 m, 7.6.1984, *Mozaffarian 48577* (TARI); ca. 30 km between Esferayen and Bojnurd, Assadli neck mt. 1800-2000 m, 29.6.1984, *Mozaffarian 48703* (TARI); 68 km on the road to Gifan from Bojnoord, after Amirabad, 1200 m, 22.5.1984, *Assadi & Maassoumi 50277* (TARI); ca. 14 km NE of Gifan, mountains N of Yazdan-Abada, 2000 m, 22.5.1984, *Assadi & Maassoumi 50332* (TARI); Shirvan, Mabanlou to Ghal-e Alkhans, 1650 m, *Termeh 41063* (Evin).

16. Astragalus indomitus group

Plants acaulescent or with short stem. Leaflets narrowly elliptic or linear, covered with appressed hairs. Inflorescence a spike. Standard rhomboid, acute at the apex.
Astragalus indomitus.

45. Astragalus indomitus Maassoumi sp. nov.

Holotypus: Tehran: Damavand, Humand station, 12.4.73, 1800 m, *Arazm & Bazargan 30771* (TARI!).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 73 (habit); - pages 220 (indument of peduncle and pods) and 224 (flower dissection).

This species is easily distinguishable by the narrowly elliptic leaflets and the narrowly rhomboid standard limb .

Plantae perennis, ca. 20 cm altae, acaules vel breviter caulescentes, caule ca. 3-4 cm longo, dense brevissime appresse albi-piloso. Stipulae lanceolatae, acuminatae, 4-6 mm longae, albi-nigri-pilosae, ad basin per 1-2 mm petiolo adnatae, inter se connatae. Folia ca. (4-) 5-9 (-11) mm longa, petiolo ca. 2-4 cm longo, sicut rachis dense brevissime subappresse piloso. Foliola 9-10 juga, anguste elliptica, 5-7 (-9) mm longa et 2-3 mm lata, supra glabra vel marginem versus sparse pilosa, subtus subappresse albi-pilosa. Inflorescentiae axillares, pedunculo 9-12 cm longo, dense brevissime albi-piloso, apicem versus pilis nigro piloso immixtis. Bracteae lineares, ca. 10-11 mm longae, subpatenter albi-nigri-pilosae. Calyx tubulosus, 14-15 mm

longus, longe patenter albi-nigri-pilosus, dentibus linearibus, ca. 4-5 mm longis. Corolla purpurea. Vexillum ca. 20 mm longum, lamina rhomboida, antice subacuta. Alae ca. 17 mm longae, lamina-anguste elliptica, antice rotundata, basi auriculata, auricula ca. 1,5 mm longa, ungue lamina sublongiore. Carina ca. 16 mm longa, lamina oblique elliptica, ungue lamino sesquilongiore. Ovarium pilosum sessile. Legumen breviter stipitatum, ovoideum, ca. 10 mm longum et 4 mm latum, ventro late carinatum, dorso applanatum et sulcatum, longe albi-lanatum, pilis brevissimis patentibus immixtis, complete biloculare.

Other specimens seen:

Tehran: Karaj, between Nesa and Gachsar, 2220 m, 2.6.1986, *Maassoumi 55102* (TARI); Lavasan, 1940 m, 26.4.1973, *Babakhanlou 20466* (TARI); Zardband, 3.5.1974, *Matin & Zargani s.n.* (EVIN).

17. Astragalus galbineus group

Plants acaulescent or with a short stem. Leaflets covered with short appressed hairs on both sides or more or less glabrous above. Inflorescence cylindric. Flowers violet or purplish. Standard rhomboid. Wing-petals slightly emarginate at apex.
Astragalus galbineus, A. sarae, A. nahavandicus.

46. Astragalus galbineus Maassoumi in Iran. J. Bot. 4: 130. 1988. **Holotype:** Lorestan, Khora-mabad, Dorud, Oshtoran Kuh, 2150 m, 6.5.1973, *M. Riazi 9692* (TARI!).

Fig.: MAASSOUMI, A.A., 1993, Illustr., guide gen. Astrag. Iran 2: plate 66 (habit); - pages 220 (indument of peduncle and pods) and 224 (flower dissection).

Plants ca. 25-30 cm tall, acaulescent or with a short stem up to 4 cm long. Stipules lanceolate, or triangular, ca. 10 mm long, abruptly attenuate toward the apex, at a length of ca. 2 mm adnate to the petiole, shortly jointed to one another, covered with appressed white and black hairs. Leaves ca. 14-15 cm long, petiole ca. 4 cm long, both petiole and rachis covered with black and white subpatent hairs. Leaflets 10-12 pairs, oblong-elliptic, 10-15 mm long and 4-5 mm broad, at the apex incised, at the base cordate, both sides covered with short appressed hairs. Inflorescence subterminal, cylindrical with numerous flowers; peduncle ca. 15 cm long, sulcate, in lower part covered with white hairs and below the raceme mixed with patent black hairs. Bracts linear, ca. 10 mm long, densely covered with spreading black and white hairs. Calyx ca. 16-17 mm, shortly inflated at the base, covered with black and white hairs, the teeth linear, ca. 5 mm long. Corolla violet. Standard ca. 18-19 mm long, the limb rhomboid, in the middle ca. 9 mm broad, towards the tip ligulate, at the apex deeply emarginate or bilobate, at the base toward the claw shortly constricted. Wing-petals ca. 18 mm long, the limb oblong, towards the apex shortly dilated, asymmetrically notched, at the base auriculate, auricle ca. 2 mm long, the claw equaling the limb. Keel ca. 15 mm long, the limb elliptic-curvate, at the apex shortly acute, at the base auriculate. Pods shortly stipitate, oblong or elliptic, ca. 10 mm long and 4-5 mm broad, terminating in a beak, ventrally slightly carinate, dorsally grooved, covered with long soft and short white hairs, fully bilocular.

Specimens seen:

Lorestan: Doroud, Gharieh-ye Saravand, Payamoun mts. (1959-2200 m), 29.5.1988, *Termeh, Karavar & Tehrani s.n.* (EVIN); Khoramabad, Dorud, Oshtoran Kuh, 2150 m, 6.5.1973, *M. Riazi*

9692 (TARI!).

47. Astragalus sarae Eig, Syst. Stud. Astrag. Near East: 40. 1955. **Type:** Iraq borealis: Jebal Sindjar, supra Beled Sindjar, 1000-1500 m, *Eig & Zohary* (HUJ!).

Fig.: Page 226 (flower dissection).

Plants perennial, acaulescent or shortly caulescent, stem up to 5 cm long. Stipules lanceolate, ca. 6-7 mm long, densely covered with black and white hairs, at a length of 1,5-2 mm adnate to the petiole and jointed to one another. Leaves ca. 8-9 cm long, petiole 2-3 cm long, both petiole and rachis densely covered with long and short spreading mixed black and white hairs. Leaflets 9-11 pairs, obtuse or emarginate, ca. 8 mm long and 3-5 mm broad, upper side nearly glabrous, only toward the margin with appressed hairs, lower side subappressed-hairy. Inflorescence dense; peduncle ca. 7-10 cm long, sulcate, covered with long and short spreading hairs, upwards mixed with black hairs. Bracts linear-lanceolate, ca. 7-9 mm long, covered with black and white hairs. Calyx tubular, slightly inflated, ca. 13-14 mm long, with long and short black and white hairs, the teeth linear, ca. 4 mm long. Corolla violet. Standard 19-20 mm, the limb rhomboid, ca. 8 mm broad, emarginate at apex. Wing-petals ca. 16 mm long, the limb elliptic, slightly emarginate at the apex, at the base auriculate, auricle ca. 1 mm long. Keel ca. 15 mm long, the limb elliptic, acute . Ovary pilose, stipitate. Pods ovoid, ca. 8 mm long and 3 mm broad, rostrate, ventrally carinate, dorsally rounded, densely coverd with lanate hairs, mixed with short spreading hairs, fully bilocular.

Notes: Species newly recorded from Iran.

Specimen seen:

Kordestan: Fagha Solemann, S of Sanandaje, 30 km from Sanandaje, 1400 m, 14.5.1986, *Fattahi 236* (TARI).

48. Astragalus nahavandicus Maassoumi, in Mitt. Bot. Staatssamml. München: 29: 506. 1990. **Holotype:** Hamadan: ca. 21 km on the road from Nahavand to Malayer, 2000 m, 11.5.1987, *Maassoumi & Mirhosseini 59365* (TARI! Iso. Herb. PODLECH!).

Fig.: MAASSOUMI, A.A., 1993, Illustr., guide gen. Astrag. Iran 2: plate 86 (habit); - pages 220 (indument of peduncle and pods) and 224 (flower dissection).

Plants acaulescent, ca. 11-13 cm tall. Stipules triangular, ca. 4-5 mm, long, densely hairy, at the base shortly adnate to the petiole and jointed to one another. Leaves ca. 8-11 cm long, petiole ca. 1,5-2 cm long, both petiole and rachis densely covered with long and short spreading hairs. Leaflets 15-17 pairs, narrowly elliptic or linear, complicate, ca. 10 mm long and 3 mm broad, upper side glabrous, lower side covered with subappressed hairs. Inflorescence a cylindric spike, flowers numerous: peduncle ca. 5-6 cm long, densely covered with black and white hairs mixed with shorter spreading white hairs. Bracts linear-lanceolate, ca. 5-6 mm long, covered with black and white hairs. Calyx tubular, ca. 11 mm long, with black and white hairs, the teeth subulate ca. 3 mm long. Corolla purplish or dark violet. Standard ca. 16 mm long, the limb rhomboid, ca. 8-9 mm broad, emarginate at the apex. Wing-petals ca. 16 mm long, the limb narrowly elliptic, rounded at the apex, at the base auriculate,

auricle ca. 2 mm long, the limb equaling the claw. Wing-petals ca. 13 mm long, the limb oblique-elliptic, nearly equaling the claw. Ovary pilose, sessile. Pods unknown.

Specimens seen:

Hamadan: Ca. 21 km on the road from Nahavand to Malayer, 2000 m, 11.5.1987, *Maassoumi & Mirhosseini 59366* (TARI).

Lorestan: Doroud, Saravand village, Kuh-e Payamoun, 1950-2200 m, *Termeh, Karavar & Tehrani (s.n.)* (EVIN).

Bakhtaran: Kuh-e parrow, 1500-2100 m, *Iranshahr & Dezfolian 40838* (EVIN).

18. Astragalus rivashensis group

Plants shortly caulescent. Both petiole and rachis covered with spreading hairs. Leaflets covered with scattered hairs on upper side, densely covered with spreading hairs on lower side. Flowers yellow. Standard limb elliptic. Pods stipitate, densely covered with long and short spreading hairs.
Astragalus rivashensis.

49. Astragalus rivashensis Maassoumi in Iran. J. Bot. 4: 139. 1988. **Holotype:** Khorasan, 56 km from Kashmar to Neyshabour after river (FE2), 1850 m, 12.6.1981, *Assadi &Mozaffarian 35657* (TARI!).

Fig.: MAASSOUMI, A.A., l.c.: 140 (habit); 1990, Illustr. guide gen. Astrag. Iran 2: plate 92 (habit); - pages 220 (indument of peduncle and pods) and 226 (flower dissection).

Plants ca. 20-30 cm tall, stem 3-4 cm long. Stipules lanceolate, acuminate ca. 7-12 mm long, covered with black and white hairs, at a length of ca. 2 mm adnate to the petiole, toward the apex abruptly attenuate. Leaves ca. 10-15 (-20) cm long, petiole 4-5 cm long, both petiole and rachis densely covered with spreading hairs. Leaflets 8-11 pairs, narrowly elliptic, 8-17 mm long and 4-6 mm broad, round-tipped or retuse, upper side scattered, lower side densely covered with spreading white hairs. Inflorescence axillary, cylindric, flowers numerous. Bracts linear, 5-8 mm long, covered with spreading black and white hairs. Calyx tubular, ca. 13-15 mm long, covered with spreading black and white hairs, the teeth triangular-acuminate, ca. 3-4 mm long. Corolla yellow. Standard ca. 20 mm long, the limb elliptic, ca. 7 mm broad, round-tipped, constricted at the base. Wing-petals ca. 18 mm long, the limb elliptic, ca. 7 mm long, round-tipped, at the base with an auricle ca. 1,5 mm long, 1/2 length of the claw. Keel ca. 18 mm long, the limb oblique-elliptic, acute-tipped, 1/2 length of the claw. Ovary pilose. Pods with a stipe 2 mm long, ovate-oblong, ca. 10-12 mm long and ca. 5 mm broad, terminating in a recurved, subulate beak, ventrally carinate, dorsally sulcate, densely covered with long, spreading, white hairs mixed short patent white hairs, fully bilocular. Seeds 4, reniform ca. 4 mm long and 2 mm broad, alveolate, brown.

Specimens seen:

Khorasan: 20 km to Kashmar on road from Neyshabour, 1800 m, 11.6.1981, *Assadi & Mozaffarian 35537* (TARI); Mts. N of Neyshabour, 1450-1600 m, 16.6.1981, *Assadi & Mozaffarian 35978* (TARI); 14 km from Kashmar to Neyshabour 1400-1500 m, 12.6.1981, *Assadi & Mozaffarian 35621* (TARI); Esferayen, vers Sabzevar, Kuh-e-Jahan, 1400-1750 m, Terme (s.n.) (Evin); In collibus Torbat-e Heydari, 1300 m, *Rechinger, Aellen & Esfandiari 4356* (W).

19. Astragalus spachianus group

Plants acaulescent, densely covered with silvery appressed hairs. Inflorescence a spike. Flowers yellow. Standard limb ovate-oblong. Pods ellipsoid.
Astragalus spachianus, A. saccatus.

50. Astragalus spachianus Boiss. & Buhse in Nouv. Mém. Soc. Imp. Naturalistes Moscou 12: 67. 1860. **Type:** pr. Jesd, 1.5.1849, *Buhse* (non vidi).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 98 (habit); - pages 217 (indument of peduncle and pods) and 226 (flower dissection).

Plants ca. 10-20 cm tall, acaulescent or with short stem ca. 3 mm long. Stipules ca. 3-5 mm long, lanceolate, acuminate, at a length of 1-2 mm adnate to the petiole, covered with white hairs or with mixed white and blackish hairs. Leaves ca. 6-10 cm long, petiole ca. 2-5 cm long, covered with short appressed hairs. Leaflets 7-11 pairs, narrowly elliptic, 7-9 mm long and 2-4 mm broad, both sides covered with appressed or subpatent hairs. Inflorescence a spike; peduncle ca. 7-14 cm long, covered with long and short spreading white hairs, sometimes mixed with blackish hairs. Pedicel nearly absent. Bracts ca. 3-4 mm long, covered with black and white hairs. Calyx ca. 12-13 mm long, pale violet, covered with white hairs or mixed with black hairs. Corolla yellow, at length turning violet. Standard ca. 18-24 mm long, the limb elliptic or obovate, at the tip slightly emarginate, near the claw constricted. Wing-petals 16-22 mm long, the limb elliptic, dilated towards the apex, round tipped, at the base auriculate, the claw 1,5 times longer than the limb. Keel 15-20 mm long, the limb oblique-elliptic or slightly curved, claw 2 times longer the the limb. Ovary pilose, shortly stipitate. Pods shortly stipitate, ca. 15 mm long and 5 mm broad, ventrally rounded, dorsally applanate and sulcate, covered with long, silky hairs, mixed with short patent whitish hairs, fully bilocular.

Notes: Specimens collected from Baluchestan area are in the indument characters different from those of other regions. Further studies are necessary in this respect.

Specimens seen:

Esfahan: 60 km E of Shahreza, Shah Ghandab, 1900-2150 m, 24.5.1975, *Foroughi 17253,* (TARI); 140 km from Mooteh to Esfahan, 1950 m, 3.5.1974, *Rechinger 46793* (W); 35 km, *41403* (EVIN); 150 km NE Esfahan, Mooteh protected area, Tang-e duzdan, 2150-2300 m, *Termeh & Tehrani 41403* (EVIN); 150 km NE Esfahan, Mooteh protected area, 31.5.1974, *Iranshahr s.n.* (EVIN); 10 km N Najafabad (30 km W Esfahan), 1800 m, Juin 65, *Pabot AE 88* (TARI); Borujen, Bakhtiari mts., 1700 m,17.5.1983, *Nowroozi 2529* (Herb. Esf.).

Fars: Fasa, Kharman-kuh, 2500 m, 6.6.1983, *Mozaffarian 46909* (TARI); N. Shiraz, 3.6.1965, *Ledingham & Assefi 4110* (TUH), Aliabad Kamin, 6.6.1988, *Kash-Kui 1412* (Evin).

Chaharmahal-e Bakhtiari: Brojen, 2200 m, 29.6.1986, *Mozaffarian 57181* (TARI); 39 km from Shahreza to Semirom, 2300 m, 5.6.1974, *Alava 1345* (Evin); ibid., *Iranshahr s.n.* (Evin); Prope Semirom, Kuh-e Surmandeh, 2750-3600 m, 7.6.1974 (Evin); Inter Shahreza et Semiran 10 km S Kohruyeh, 5.6.1974 (Evin).

Hormozgan: Kuh-e Genu, 7.3.1973, *Iranshahr & Moussavi 15468* (Evin); Kuh-e Genu, 2000-2300 m, 5.5.1977, *Sojak 7736* (PR); ibid., *Mozaffarian & al. 39804* (TARI).

Kerman: Kerman, Lalehzar, Baghabad, 2600 m, 19.6.1975, *Foroughi & Assadi 17906* (TARI); Gheytol-Arab on the road to Kuh-e Hazar, 2350 m, 15.6.1975, *Foroughi & Assadi 16203* (TARI); on the way of Kuh-e Hazar, 2700 m, 15.5.1975, *Foroughi & Assadi 16216* (TARI); Khabar va-Rochun protected region, 50 km SW of Baft, E side of Kuh-e Khabar, 12 km E of Khabar, 2800 m, 8.6.1977, *Assadi, Edmondson & Miller 1679* (TARI); in montibus Lalehzar, 2800-400 m, 25.5.1977, *Sojak 7751*

(PR); Inter Bam et Djiroft, Deh-Bakri, 2100 m, *Rechinger, Aellen & Esfandiari 3680* (Evin); Chah Choghuk, 1400 m, 3219 (Evin); Kuh-e Lalehzar, 3000 m, 11.7.1982, *Bornmüller 3774* (B); 4 km SW of Baft, 2000 m, 2.5.1975 parris 75.309 (E).

51. Astragalus saccatus Boiss., Diagn. Pl. Or. Nov. 9: 53. 1849. **Type:** prope Isfahan, *Aucher-Eloy 4431* (P!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 97 (habit).

Plants acaulescent, ca. 10-18 cm tall, densely covered with short silvery hairs. Stipules triangular, ca. 2-3 mm long, at the base shortly adnate to the petiole and jointed to one another, covered with white, subappressed hairs. Leaves 5-6 cm long, petiole ca. 1-1.5 cm, both petiole and rachis covered with short spreading hairs mixed with few isolated long white hairs. Leaflets 5-8 (-10) pairs, oblong-elliptic, 7-9 mm long and 4-5 mm broad, covered with subappressed hairs on both sides. Inflorescence a 10-12-flowered spike; peduncle ca. 2 mm thick and 5-8 cm long, densely covered with short spreading hairs mixed with some isolated long white hairs. Bracts linear, lanceolate, ca. 5 mm long, covered with spreading white hairs, very rarely mixed with few black hairs. Calyx tubular, 13-15 mm long, slightly inflated at base, but ruptured by the fruit, covered with short spreading white hairs, the teeth 2-2.5 mm long, covered with short hairs. Standard ca. 21 mm long, the limb oblong. Wing-petals ca. 18 mm long, the limb oblong, slightly dilated toward the tip, at the base auriculate, auricle ca. 1,5 mm long, claw nearly twice as long as the limb. Ovary pilose, shortly stipitate. Pods nearly sessile, ca. 13 mm long and 4 mm broad, attenuate at the apex, ventrally rounded, dorsally sulcate, densely covered with long hairs mixed with short spreading hairs, fully bilocular.

Notes: This species has been transferred from section *Grammocalyx* Bunge to section *Malacothrix* Bunge.

Specimens seen:

Isfahan: Tiran, Ghameshlow, Tang-e Najafabadi, 2100 m, *Nowroozi, Feyzi & Shamanpoor 5318, 5465* (TARI); on the road from Shahreza to Semirom, 45 km to Semirom, 2370 m, *Zarre 69621* (TARI); 6 km from Shahreza on the road to Shiras, Kuh-e Dombalan, 2000 m, *Foroughi 17273* (TARI); 60 km E of Shahreza, Shah-Ghandab, 1900-2150 m, *Foroughi 17293* (TARI); Brojen, 2200 m, *Mozaffarian 57181* (TARI).

Kerman: Shahrak-e Maadan-Mes, 65 km SW Rafsanjan, 2500-2600 m, *Djadidi 23816* (TARI).

Fars: 60 km S of Abadeh, Kuh-e Bul, prope Eghlid, 2470 m, *Foroughi 17371* (TARI); Tangh-e Kalanjej, NW Sisakht, 2420 m, *Safayian 182* (TARI).

Baluchestan: Taftan mts. region, Tamendan valley 2300-2500 m, *Mozaffarian 53133* (TARI); Taftan mt. S slope, above Torshab, 1900-2300 m, *Runemark, Assadi & Sardabi 22646, 22632* (TARI); ca. 40 km N of Khash, Torshab, 2000-2300 m, *Assadi 22859* (TARI).

20. Astragalus heterodoxus group

Plants caulescent, covered with silvery appressed hairs. Leaflets verticillate. Inflorescence axillary. Flowers greenish-yellow. Standard obovate.
Astragalus heterodoxus.

52. Astragalus heterodoxus Bunge in Mém. Acad. Imp. Sci. Saint Petersbourg, 11 (16): 53. 1868 in clave et l.c. 15(1): 88. 1869. **Typus:** Persia austro-orient., supra pagum Diracht-inshan, inter Chäbbis et Kerman (P!).

Fig.: MAASSOUMI, A.A., 1990, Illustr. guide gen. Astrag. Iran 1: plate 86 (habit); - pages 218 (indument of peduncle and pods) and 226(flower dissection).

Plants ca. 15-30 cm tall, acaulescent or with developed stem up to 15 cm long. Stipules ca. 10 mm long, covered with short black and white hairs, toward the apex abruptly acuminate, setaceous, at a length of ca. 3 mm adnate to the petiole, otherwise free or sometimes jointed to one another. Leaves 9-16 cm long, petiole 2-6 cm long, both petiole and rachis covered with short patent hairs and rarely mixed with long spreading hairs. Leaflets verticillate, in 7-8 verticils of 4 leaflets narrowly elliptic, ca. 16 mm long and 2-6 mm broad, both sides covered with appressed hairs. Inflorescence a cylindrical spike ca. 7-9 cm long, peduncle 10-11 cm long, covered with short hairs, towards the inflorescence mixed with some black hairs. Pedicel short. Bracts linear, ca. 6-7 mm long, covered with appressed blackish hairs, or rarely mixed with white hairs. Calyx tubular, ca. 14-15 mm long, covered with long silky white hairs and rarely with scattered black hairs. Corolla yellow, turning to violet. Standard ca. 20 mm long, the limb obovate, emarginate or incised at the tip, at the base near the claw constricted. Wing-petals ca. 17 mm long, the limb elliptic, round tipped, at the base auriculate. Keel ca. 16 mm long, the limb oblique-elliptic, claw two times longer than the limb. Ovary pilose, sessile. Pods ovoid, ca. 11 mm long and 2 mm high, ventrally rounded, dorsally applanate, covered with long soft whitish hairs mixed with short spreading hairs, bilocular, few-seeded.

Specimens seen:

Kerman: Sekondj, at the hills to the NW of the village, steppic vegetation, 2170-2250 m, 10.5.1985, *Zehzad 85049* (TARI); near Sarcheshmeh copper mine, 2700 m, 3.6.1986, *Assadi & Bazargan 56425* (TARI); ca. 70 km NW of Rawar, near the town Kuhbanan, Davedan mt. 2400-3200 m, 31.5.1986, *Assadi & Bazgosha 56148* (TARI).

Yazd: Ca. 50 km E of Baft mts. above the village Hamsook, 2300-2600 m, *Assadi & Bazgosha 56102* (TARI).

21. Astragalus chrysotrichus group

Plants caulescent. Petiole and rachis covered with long and short spreading hairs. Leaflets covered with scattered patent hairs on upper side and subappressed hairs on lower side. Inflorescence axillary, cylindric. Calyx teeth linear, ca. 6 mm long. Flowers yellow. Standard rhomboid. Pods covered with long and short spreading hairs.
Astragalus chrysotrichus.

53. Astragalus chrysotrichus Boiss., Diagn. Pl. Or. Nov. 2: 75. 1843. **Typus:** Persia austr., inter Fars et Shiraz, *Aucher-Eloy 4414* (G-BOIS, K!).

Fig.: Pages 217 (indument of peduncle and pods) and 226 (flower dissection).

Plants caulescent, up to 36 cm tall, densely covered with long subappressed hairs. Stipules lanceolate, acuminate, ca. 10-11 mm long, densely covered with black and white hairs, at the base distinctly rugose, at a length of 3-4 mm adnate to the petiole and shortly jointed to one another. Leaves ca. 10-11 cm long, petiole ca. 6 cm long, both petiole and rachis covered with

long and short spreading hairs. Leaflets 15 pairs, narrowly elliptic, acute, ca. 12 mm long and 4-5 mm broad, upper side subglabrous or sometimes with some scattered long spreading hairs, lower side densely covered with long subappressed hairs. Inflorescence cylindric, elongating in fruit, peduncle ca. 13-14 cm long, sulcate, covered with short and long spreading hairs. Bracts linear, 12-15 mm long, ciliate at the margin or covered with some scattered black and white hairs. Calyx tubular, ca. 15 mm long, covered with long hairs, the teeth setaceous, ca. 6 mm long. Corolla yellow. Standard ca. 18-19 mm long, the limb rhomboid, in middle part ca. 6 mm broad. Wing-petals ca. 16-17 mm long, the limb narrowly elliptic, rounded at the tip, auriculate at the base, auricle ca. 0,5 mm long, claw much longer than the limb. Keel ca. 15 mm long, the limb elliptic-curvate. Ovary pilose, sessile. Pods shortly stipitate, ovoid, ca. 12 mm long and 4-5 mm broad, ventrally slightly carinate, dorsally sulcate, attenuate toward the apex, ending in a long recurved beak ca. 5 mm long, densely covered with long hairs mixed with short spreading hairs, fully bilocular.

Notes: The double indument on vegetative part and the pods and the shape of petals clearly separate this taxon from it old synonym *A. mollis* M.Bieb.

Specimens seen:

Khorassan: Mountes Hazar Masjed, inter Ardak at Tolgor 1200-1600 m, 7.-10.6.1948, *Rechinger & Aellen 5018* (W).
Kordestan: Hassin-abad, 35 km N Sanandaj on road to Diwandarra, 1530 m, 30.5.1986, *Fattahi 724* (TARI).
Esfahan: Esfahan to Daran, Ghahis protected area, 2500 m, 5.5.1981, *Nowroozi 238* (Res. Cent. Esf.).
Tehran: 10 km E Tehran, 1600-1700 m, 10.5.1972, *Dini & Arazm 1554* (TARI); Chitgar, 1320 m, 27.4.1970, *Foroughi 74* (TARI).

22. Astragalus daghdaghabadensis group

Plants acaulescent. Leaflets glaucous, upper side glabrous, lower side covered with scattered short, appressed hairs. Stipules glabrous.
Astragalus daghdaghabadensis

54. Astragalus daghdaghabadensis Maassoumi in Iran. J. Bot. 5: 3. 1991. **Holotype:** Hamadan, Kabutar-Ahand, Daghdaghabad, Gholiabad, Kuh-e Gholiabad, 1800-2100 m, 4.6.1988, *Mozaffarian 64502* (TARI!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 64 (habit); - pages 220 (indument of peduncle and pods) and 226 (flower dissection).

Plants acaulescent, glaucous, ca. 13-22 cm tall. Caudex much divided. Stipules 4-8 mm long, lanceolate, acuminate, glabrous or ciliate at the margin, at the base distinctly rugose, at a length of 2 mm adnate to the petiole, shortly jointed to one another. Leaves ca. 8-10 cm long, petiole 2-3,5 cm long, both petiole and rachis covered with black and white appressed hairs. Leaflets ca. 12-13 pairs, oblong, at the apex rounded or retuse, ca. 5-8 mm long and 2-3 mm broad, upper side glabrous, lower side covered with very short appressed hairs. Inflorescence solitary, peduncle ca. 7-13 cm long, covered with spreading white hairs, toward the inflorescence mixed with black hairs, flowers numerous, nearly sessile. Bracts linear-lanceolate, acuminate, ca. 5-8 mm long, pilose. Calyx 14-15 mm long, tubular, shortly inflated, densely

covered with long black and white hairs, the teeth linear, ca. 5 mm long. Corolla yellow. Ovary pilose, sessile. Pods shortly stipitate, ovoid, ca. 10-12 mm long and 4-5 mm broad, ventrally slightly carinate, dorsally deeply sulcate, rostrate, the beak curvate, densely lanate, fully bilocular.

Specimens seen:

Hamadan: Kabutar-ahang, Daghdaghabad, Goliabad, Kuh-e Goliabad, 1800-2100 m, 4.6.1988, *Mozaffarian 64502* (TARI).

Azarbayejan: 44 km S Rezaiyeh, Darreh-e Ghasemlou, 1850-1990 m, 10.6.1978, *Matin & Daneshpajou 38407* (Evin).

23. Astragalus hendelanicus group

Plants shortly caulescent. Petiole and rachis covered with spreading hairs. Leaflets covered with appressed hairs. Inflorescence axillary, cylindric. Flowers yellow. Standard obovate. Pods densely covered with long and short, spreading hairs.
Astragalus hendelanicus.

55. Astragalus hendelanicus Maassoumi in Iran. J. Bot. 5: 14. 1991. **Holotype:** Azarbayejan, Mianeh to Khalkhal, ca. 32 km,on the road from Hendelan to Yal-Gheslagh, 1550 m, 27.5. 1987, *Maassoumi 64907* (TARI!, Iso. Herb. PODLECH!).

Fig.: MAASSOUMI, A. A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 70 (habit); - pages 220 (indument of peduncle and pods) and 226 (flower dissection).

Plants ca. 20-22 cm tall, acaulescent or with short stem up to 2,5 cm long. Stipules lanceolate, abruptly acuminate, ca. 10-11 mm long, glabrous or ciliate at the margin, at a length of 2-4 mm adnate to the petiole and shortly jointed to one another. Leaves ca. 15-17 cm long, petiole ca. 3-3.5 cm long, both petiole and rachis covered with spreading hairs. Leaflets 12-13 pairs, remote, oblong-elliptic, rounded at the apex or slightly emarginate, 10-15 mm long, and 4-6 mm broad, both sides covered with appressed hairs. Inflorescence a dense spike, peduncle 10-13 cm long, covered with short spreading white hairs, flowers numerous, nearly sessile. Bracts linear, filiform, ca. 10 mm long, with black and white hairs. Calyx tubular, ca. 14-15 mm long, covered with black and white hairs. Corolla yellow. Standard ca. 17 mm long, the limb obovate. Wing-petals ca. 15 mm long, the limb narrowly elliptic, rounded at the apex, auriculate at the base, auricle ca. 1,5 mm long, the limb equaling the claw. Keel ca. 14 mm long, the limb oblique-elliptic, equaling the claw. Ovary pilose, shortly stipitate. Pods shortly stipitate, ovoid, ca. 7 mm long and 3-4 mm broad, ventrally slightly carinate, dorsally applanate and sulcate, attenuate toward the apex and shortly rostrate, densely long-lanate, mixed with short spreading hairs.

Specimen seen:

Azarbayejan: Mianeh to Khalkhal, ca. 32 km on the road from Hendelan to Yal-ghenshlagh, 1500 m, 27.5.1987, *Maassoumi 64907* (TARI; Herb. PODLECH).

24. Astragalus holopsilus group

Plants caulescent. Leaflets glaucous, glabrous above, very short appressed hairs along the mid-vein on lower side. Inflorescence axillary. Flowers violet. Standard limb strongly ligulate-attenuate toward the apex.
Astragalus holopsilus, A. lippertii, A. kabristanicus.

56. Astragalus holopsilus Bunge in Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 56. 1868 in clave et l.c. 15 (1): 83. 1869. **Syntypes:** Esfahan, *Jenisch*; dto., *Bode* (non vidi).
= *A. stenocalyx* Eig, Syst. Stud. Astrag. Near East: 29. 1955. **Holotype:** Western Persia, Sultanabad, 24.5.1890, *Th. Strauss* (K!).

Fig.: MAASSOUMI, A. A. 1990, Illustr. guide gen. Astrag. Iran 1: plate 87 (habit); page 218 (indument of peduncle and pods) and 226 (flower dissection).

Plants up to 35 cm tall, caulescent, with developed glabrous stems. Stipules lanceolate, ca. 3-4 mm long, free from one another and the petiole. Leaves ca. 5 cm long, petiole short, ca. 1,5 cm long. Leaflets 9-10 pairs, elliptic, glabrous, ca. 10-12 mm long and 3-5 mm broad, acuminate, cuneate at the base. Inflorescence axillary, a dense spike, peduncle 7-9 cm, flowers numerous, pedicels with short hairs. Bracts ovate, ca. 2 mm long, covered with short black hairs. Calyx tubular, ca. 6-7 mm long, vested with spreading black and white hairs, the teeth triangular, ca. 1,5 mm long. Corolla violet. Standard ca. 20 mm long, the limb rhomboid, ca. 6 mm broad, ligulate-attenuate toward the apex, round-tipped. Wing-petals ca. 15 mm long, the limb narrowly elliptic, round-tipped, at the base auriculate, 2 times longer than the claw. Keel ca. 12 mm long, the limb oblique-elliptic or curvate, equaling the claw. Ovary pilose, sessile. Pods ovoid, ca. 8 mm long and 3 mm broad, ventrally applanate or shortly grooved, dorsally sulcate, terminating in a recurved beak, covered with long spreading white hairs, incompletely bilocular.

Specimens seen:

Esfahan: Vardasht-e Semirom, Ghoutapassi, 23 km SE Boroudjen, 2380 m, 25.5.1984, *Aryarand & Rahiminejad 10228 b* (Univ. Esf.); 35 km from Shahreza to Semirom, Gardaneh-e Khoros-Galou, 2300 m, 19.5.1986, *Mozaffarian 54347* (TARI); Shahr-e Kurd, Ben, Harchegan, 2650 m, 12.6.1987, *Mozaffarian 61085* (TARI); Shahr-e Kurd, Shalamzar, Agha-Sabz, 2400 m, 28.5.1986, *Mozaffarian 54590* (TARI); Khonsar, Khamis, Tchog Gard, 2300 m, 19.6.1989, *Termeh & Karavar* (s.n.) (Evin).
Chaharmahal-e Bakhtiari: Borojen, Boldaji Kalbibadk (Foot of mt. Kallar), 2250 m, 3.7.1986, *Mozaffarian 57350* (TARI); Tang-e Sayad, 2550 m, 3.6.1974, *Rechinger 47236* (W); Bordekan, 40 km N Kohruyeh between Shahreza and Semiron, 2700 m, 5.6.1974, *Rechinger 47387* (W).
Tehran: Arak to Mahallat, Neck Mt. close to Bozijan, 2300 m, 14.6.1984, *Mozaffarian & Maassoumi 47983* (TARI).

57. Astragalus lippertii Maassoumi & Podlech in Mitt. Bot. Staatssamml. München 29: 513. 1990. **Holotype:** Azarbayejan, Rezayeh, Serow, 1870 m, 15.6.1972, *Foroughi 6313* (TARI!; Iso: Herb. PODLECH!).

Fig.: MAASSOUMI, A.A., 1993, Illustr., guide gen. Astrag. Iran 2: plate 81 habit); - pages 220 (indument of peduncle and pods) and 226 (flower dissection).

Plants ca. 35 cm tall, caulescent, covered with short appressed scattered hairs, stem ca. 10-12 cm long. Stipules ca. 8-10 mm long, at the base shortly adnate to the petiole, vaginate, jointed to one another, abruptly attenuate toward the apex. Leaves ca. 10-17 cm long, petiole 4-5 cm long, both petiole and rachis covered with short appressed, scattered hairs. Leaflets 11-13 pairs, elliptic, 6-15 mm long and 8-9 mm broad, rounded at the apex or shortly emarginate, upper side glabrous, lower side with some isolated appressed hairs along the mid-vein. Inflorescence a raceme ca. 5-6 cm long, peduncle ca. 15-18 mm long, sulcate, covered with short appressed white hairs or mixed with some black hairs, flowers numerous. Bracts green, linear-acuminate, 8-12 mm long. Pedicels short. Calyx 14-15 mm long, tubular, covered with long appressed or subpatent hairs, the teeth 5-6 mm long, linear. Corolla dark violet. Standard ca. 25 mm long, the limb rhomboid, ca. 10 mm broad, ligulate-attenuate toward the apex. Wing-petals ca. 17 mm long, the limb narrowly oblong, rounded at the apex, at the base auriculate, auricle ca. 2 mm long, the limb equaling the claw. Keel ca. 15 mm long, the limb oblique-elliptic or triangular, 1/2 length of the claw. Ovary sessile, pilose. Pods sessile, ovoid, rounded the base, acuminate at the apex, 12-14 mm long and ca. 7 mm broad, ventrally, carinate, dorsally deeply sulcate, fully bilocular.

Specimen seen:

Azarbayejan: Rezaiyeh, Serow, 1870 m, 15.6.1972, *Foroughi 6313* (TARI; Herb. PODLECH).

58. Astragalus kabristanicus Grossh. in Fl. USSR 12: 884. 1946. **Typus:** Distr. Chisy inter Alty-Agatsch et Chilmi'i, 12.5.1929, *M. Sachokia* (BAK) non vidi.

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 76 (habit); - pages 217 (indument of peduncle and pods) and 226 (flower dissection).

Plants ca. 12-15 cm tall, acaulescent or with a short stem up to 4 cm long. Stipules 6-7 mm long, lanceolate, pilose, at a length of 1-2 mm adnate to the petiole and shortly jointed to one another. Leaves ca. 8-9 cm long, petiole short, 1-2 cm long, both petiole and rachis densely covered with short appressed hairs. Leaflets 12-15 pairs, elliptic or ovate, obtuse at the tip, ca. 7-8 mm long and 3-4 mm broad, upper side glabrous, ciliate at the margin and pilose on lower side along the mid-vein. Inflorescence a spike, peduncle ca. 6-8 cm long, covered with appressed black and white hairs, flowers numerous, nearly sessile. Bracts 5-7 mm long, linear, covered with black and white hairs. Calyx tubular, ca. 10 mm long, green or pale violet, covered with black and white hairs, the teeth setaceous or subulate, 3-4 mm long. Corolla blue or violet. Standard ca. 20 mm long, the limb rhomboid, ca. 8 mm broad, ligulate-attenuate towards the apex, emarginately tipped or shortly bilobate, at the base near the claw abruptly constricted. Wing-petals ca. 18 mm long, the limb elliptic, round-tipped, at the base auriculate, claw equaling the limb. Keel ca. 15 mm long, the limb oblique-elliptic, towards the tip shortly curved, claw equaling the limb. Pods shortly stipitate, ovoid, ca. 10 mm long and 5 mm broad, ventrally carinate, dorsally deeply sulcate, at the tip rostrate, densely covered with long silky hairs, mixed with short patent white hairs, fully bilocular.

Note: New record from Iran.

Specimens seen:

Azarbayejan: 33 km to Shahpur on road from Khoy, 1500 m, 30.6.1978, *Assadi & Mozaffarian 30492* (TARI); 12 km on the road from Salmas to Khoy (Ghareh tappeh) 1550 m, 28.6.1986, *Maassoumi & Abouhamseh 57038* (TARI); Salmas Ghooshehi pass, 1530-1800 m, 5.7.1976, *Amini*

6985 (TARI); 25 km E of Uroumieh, Chiehlou, 1320 m, 25.5.1982, *Akbarzadeh 41133* (TARI); 27 km from Salmas to Uroumieh (Ghosh-Chi neck), 1650 m, 26.6.1986, *Maassoumi & Abouhamzeh 57006, 57005* (TARI); Uromieh, Sir Mou-Heydarlu, 19.5.81, *Tarighi & Amini 2917* (TARI); 38 km S Rezaiyeh, Darreh-Ghasemlou, 1500-1650 m, *Matin & Danesh-Pajouh 38398* (EVIN); Between Shahpur and Rezaieh, 1500-1700 m, 12.6.1977, *Moussavi & Tehrani 36802* (EVIN); 38 km S Rezaiyeh, Darreh-e Ghasemlou, 1500-1650 m, 3.6.1978, *Matin & Daneshpajouh 38398* (EVIN); Mianeh to Khalkhal, ca. 32 km on the road from Hendelan to Yal-Gheshlagh, 1550 m, 27.5.1987, *Maassoumi 64902* (TARI); ca. 24 km on the road from Mianeh to Gharah-Chaman, 1350 m, 26.5.1987, *Maassoumi 64889* (TARI); ca. 18 km on the road from Mianeh to Gharah-Chaman, 1300 m, 25.5.1987, *Maassoumi 64881, 64883* (TARI); Zanjan, between Toghai and Mianeh, 1450 m, 26.5.1987, *Maassoumi 64876* (TARI); on the old road from Gharah-Chaman to Torkeman-Chay, 1800 m, 26.5.1987, *Maassoumi 64894* (TARI); W Rezaiyeh, valley NW of Silvana village, 1500-1600 m, 22.5.1976, *Runemark & Foroughi 19676* (TARI); Sarab, Ghariyeh Mir Kouh-Hadji, 1700-1900 m, *Termeh & Danesh-Pajuh 41363* (EVIN).

25. Astragalus macrourus group

Plants scapose, acaulescent. Peduncle much longer than the leaves. Flowers yellow. Standard ligulately attenuate toward the apex.Pods ovaloid, sessile.
Astragalus macrourus, A. eugenii, A. elegans.

59. Astragalus macrourus Fisch. & C.A.Mey., Bull. Soc. Imp. Naturalistes Moscou 11: 346. 1838. **Typus:** pr. Tatuni in tr. Suwant, *Hohenacker* (LE) non vidi.

Fig.: MAASSOUMI, A.A., 1990, Illustr. guide gen. Astrag. Iran 1: plate 88 (habit); - pages 217 (indument of peduncle and pods) and 226 (flower dissection).

Plants acaulescent, glaucous, densely covered with short appressed, silvery hairs. Caudex much divided. Stipules lanceolate triangular, acuminate, rugose, pilose, at a length of 3-4 mm adnate to the petiole. Leaves 10-25 cm long, petiole 2-6 cm long, both petiole and rachis densely covered with white appressed hairs. Leaflets 17-25 pairs, oblong-elliptic, obtuse or sometime acute, both sides covered with appressed hairs, ca. 8-15 mm long and 3-8 mm broad. Inflorescence ovate or oblong, becoming cylindrical in fruit, ca. 3-10 cm long, peduncle 8-20 cm long, covered with short white, subappressed hairs, below the spike densely mixed with black hairs. Bracts acuminate, ca. 5-7 mm long, densely hairy. Calyx tubular, 10-14 mm long, covered with black and white hairs, the teeth subulate or linear, ca. 2-4 mm long. Corolla greenish yellow (in vivo). Standard 20-24 mm long, the limb rhomboid, ca. 9 mm broad, emarginate at apex. Wing-petals ca. 18 mm long, rounded at apex, at the base auriculate, auricle ca. 1 mm long. Keel ca. 16 mm long, the limb oblique-elliptic. Ovary pilose, sessile. Pods ovoid, ca. 12 mm long and 6 mm broad, terminating in a long recurved beak ca. 4 mm long, ventrally applanate and slightly carinate, dorsally deeply sulcate, densely covered with long white hairs mixed with short spreading white hairs,fully bilocular.

Specimens seen:

Kordestan: Kharaka station, N of Sanandaj, 40 km from Sanandaj, 2100 m, 14.5.1986, *Khaledian 1131* (TARI); ibid. *Massoumi (s.n.)* (TARI); around Sanandaj, 1900-2000 m, *Khaledian 2542* (TARI); Mahmara village, ca 20 km NW of Marivan, 1520 m, 11.5.1986, *Fattahi & Khaledian 563* (TARI); 33 km NW Divandareh, 2100 m, 29.6.1974, *Rechinger 48581* (W).

Hamadan: Ca. 41 km from Kangavar to Hamadan, 2200 m, 9.5.1987, *Maassoumi & Mirhosseini 59323* (TARI); ca. 11 km on the road from Songhor to Kangavar, 2000 m, 9.5.1987, *Maassoumi &*

Mirhosseini 59306 (TARI); Avadje, Sultan-Bulagh mts. 2000-2400 m, 12.5.1989, *Maassoumi & Mirhosseini 59389, 59390* (TARI).

Azarbayejan: W of Rezayeh, Targavar valley, W of Aubi village, 1900 m, 23.5.1976; pass, ca. 20 km S of Ahar on the road to Tabriz, 1700-1800 m, 31.5.1978, *Wendelbo & Assadi 27934* (TARI); W Rezayeh, Targevar valley, W of Aubi village, 1900 m, 23.5.1975, *Runemark & Foroughi 19774* (TARI); Meshginshahr, 1600 m, 25.5.1989, *Youssefy 2681* (Univ. Tabris).

Bakhtiari: Shahr-e Kurd, Ben, 2650 m, 12.6.1987, *Mozaffarian 62056* (TARI); Shahr-e Kurd, Baba-Heydar, Sefid-Daneh, 2380 m, 21.5.1986, *Mozaffarian 54358* (TARI); Chehel Dokhtaran Kuh, 2800 m, 2.6.1959, *Wendelbo 1742* (K).

Esfahan: Feridoun shahr, Posht kuh-Moghoei, between Sokan and Gorab, 2300 m, 20.5.1984, *Khajeddin & Sabzevari 2496* (TARI); Feridoun shahr, Meydanak, above Damdaran protected area, 2600 m, 25.5.1981, *Nowroozi 399* (TARI); Feridoun shahr, Meydanak, Sardab-e Dsofla, 2550 m, 25.5.1981, *Nowroozi 426* (TARI).

60. Astragalus eugenii Grossh. in Fl. USSR 12: 884. 1946. **Holotypus:** Caucasus Daghestan, prope Kurusch, *Becker* (LE) non vidi.

Fig.: MAASSOUMI, A.A., 1990, Illustr. guide gen. Astrag. Iran 1: plate 85 (habit); - pages 221 (indument of peduncle and pods) and 226 (flower dissection).

Plants acaulescent, ca. 60 cm tall. Stipules acuminate, ca. 16-18 mm long, at a length of 3-4 mm adnate to the petiole. Leaves 25-31 cm long, petiole 8-12 cm long, both petiole and rachis covered with appressed white hairs. Leaflets 20-21 pairs, ovate or elliptic, acuminate, 10-20 mm long and 5-8 mm broad, at the base cuneate, upper side glabrous or covered with appressed hairs toward the margin, lower side densely covered along the mid-vein or scattered toward the margin. Inflorescence a cylindric spike ca. 17 cm long, peduncle longer than the subtending leaves, ca. 34 cm long, sulcate, covered with appressed white hairs or sometimes mixed with some scattered black hairs. Pedicel nearly abscent. Bracts linear, 8-11 mm long, covered with black and white hairs. Calyx tubular, ca. 12-13 mm long, the teeth triangular, ca. 2 mm long, covered with appressed black and white hairs. Corolla yellow or violet. Standard ca. 22 mm long and 10 mm broad, rhomboid, ligulate-attenuate toward the apex, emarginately tipped or bilobate. Wing-petals ca. 19 mm long, the limb elliptic, shortly dilated toward the apex, round tipped, at the base auriculate, auricle ca. 1,5 mm long, the limb 1/2 times shorter than the claw. Keel ca. 7 mm long, the limb oblique-elliptic, curvate, 1/2 time shorter than the claw. Pods ovoid, ca. 10 mm long and 4 mm broad, ventrally carinate, dorsally applanate or slightly sulcate, densely covered with long soft yellowish hairs, mixed with short spreading white hairs, fully bilocular.

Notes: A new record from Iran.

Specimen seen:

Azerbayejan: Rezayieh, Targavar, 1750 m, 13.6.1972, *H. Foroughi 6258* (TARI).

61. Astragalus elegans Bunge in Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 55. 1868 in clave et l.c. 15 (1): 89. 1869. **Syntypes:** Persia Adserbidshan, prope Tabriz, *Szovits*; pr. Sseid-abbad, *Bunge & Bienert* (P!) ≡ *A. tabrisianus* E.Sheld., Minnesota Bot. Stud. 1: 154 (1894), nom. illeg.

Fig.: MAASSOUMI, A. A., 1990, Illustr. guide gen. Astrag. Iran 1: plate 83 (habit); - pages 221 (indument of peduncle and pods) and 226 (flower dissection).

Plants acaulescent, glaucous, densely villose, ca. 20-30 (-40) cm tall. Stipule triangular-acuminate, rugose, 10-12 mm long, pilose, at a length of 3-4 mm adnate to the petiole. Leaves ca. 10-20 cm long, petiole ca. 2-4 cm long, both petiole and rachis densely covered with long appressed hairs. Leaflets 20-30 pairs, ovate-oblong or narrowly elliptic, acute at apex, 8-15 mm long and 2-3 mm broad, upper side glabrous or rarely long villous, lower side densely villous. Inflorescence a spike 3-12 (-20) cm long, peduncle 10-20 cm long, deeply sulcate, densely covered with short appressed black and white hairs. Bracts linear, 5-7 mm long, with black and white hairs. Calyx tubular, ca. 14-15 mm long, covered with long white hairs mixed with short spreading hairs, the teeth subulate, ca. 3-4 mm long. Corolla greenish yellow or rarely purplish or violet. Standard 25-28 mm long, the limb rhomboid. ca. 7 mm broad, at the apex deeply emarginate or bilobed. Wing-petals 18-22 mm long, the limb oblong, dilated toward the apex, round-tipped. Keel 16-20 mm long, the limb triangular. Ovary sessile, pilose. Pods ovaloid, ca. 9 mm long and 4 mm broad, terminating in a curved beak 2-3 mm long, ventrally carinate, dorsally deeply sulcate, densely covered with long white hairs mixed with short spreading, black hairs, fully bilocular.

Notes: This species is very variable in of flower colour. Also the size of peduncle and spike varies to some extent.

Specimens seen:

Azarbayejan: Rezaiyeh to Shahpour, 18.5.1996, *Slotani & Kashkuli 6848* (EVIN); Tabriz to Ahar, 1800 m, 30.5.1971, *Rechinger (s.n.)* (W); Kalibar, Nabidjan, Doghroun mts., 2720 m, 26.6.1978, *Termeh, Moussavi & Habibi 38952* (EVIN); Ibidem, 2320-2750 m, 27.6.1987, *Termeh, Moussavi & Habibi 38948* (EVIN); Arasbaran protected area, mountains S of Kharil, 2000-2500 m, 9.6.1976, *Assadi & Maassoumi 2025* (TARI); Ibidem, between Kharil and Makidi, 2000 m, 29.5.1977, *Assadi & Vosughi 24894 a* (TARI); 19-20 km from Ahar to Tabriz, 1600-1700 m, 24.6.1986, *Maassoumi & Abouhamzeh 56960* (TARI); 50 km from Tabriz to Payam to Mishudagh mts. 2000-2200 m, 25.6.1986, *Maassoumi & Abouhamzeh 56977* (TARI); Kalibar, Nabidjan, Doghroun mts. 2700 m, *Termeh, Moussavi & Habibi 38952* (EVIN); Maku to Khoy, mountains SW Kelisa kandi, 2400-2650 m, 29.6.1978, *Assadi & Mozaffarian 30309* (TARI).

26. Astragalus eriopodus group

Plants caulescent. Leaflets oblong elliptic. Inflorescence axillary. Bracts foliaceous. Corolla violet. Standard limb rhomboid. Pods stipitate.
Astragalus eriopodus, A. vessalae.

62. Astragalus eriopodus Boiss., Diagn. Pl. Or. Nov. 2: 48 (1843). **Syntypes:** Persia prov. Aderbidjan, *Aucher-Eloy 4408 & 4422* (K!).

= *A. stenostachys* Beck in Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl., 2. Abt. 51: 333. 1886 ≡ *A. eriopodus* Boiss. var. *stenostachys* (Beck) Sirj. & Rech.f.

= *A. eriopodus* Boiss. var. *longepedunculatus* Parsa, Fl. Iran 9: 28. 1966. **Holotypus:** W Arak, 22.3.1957, *Parsa ?* (K) non vidi.

Fig.: MAASSOUMI, A.A., 1990, Illustr. guide gen. Astrag. Iran 1: plate 84 (habit); - pages 217 (indument of peduncle and pods) and 226 (flower dissection).

Plants ascendent, ca. 25-50 cm tall, with developed stems. Stipules foliaceous, broadly ovate, ca. 16-18 mm long, covered with white hairs or mixed predominantly with black hairs, abruptly attenuated toward the apex, at a length of 1-2 mm adnate to the petiole and free from one another. Leaves 8-22 cm long, petiole very short, ca. 1-1,5 cm long, together with the rachis vested with white spreading hairs or sometimes mixed with scattered black hairs. Leaflets 9-12 pairs, oblong-elliptic, 10-25 mm long and 4-10 mm broad, upper side glabrous or with scattered hairs toward the margin, lower side covered with appressed hairs. Inflorescence a spike, peduncle ca. 7-8 cm long, covered with long soft hairs, mixed with short spreading white hairs or with black and white hairs. Bracts linear, ca. 10-12 mm long, vested with black and white hairs. Calyx tubular, 11-16 mm long, purplish, covered with spreading white hairs or mixed with some black hairs, the teeth subulate, 2-6 mm long. Corolla violet. Standard 18-25 mm long, the limb rhomboid, 8-10 mm broad in the middle part, ligulate-attenuate toward the apex, emarginately tipped or bilobate. Wing-petals 16-18 mm long, the limb narrowly elliptic, rounded at apex, at the base distinctly auriculate, equaling the claw. Keel 14-17 mm long, the limb oblique elliptic or curved, shorter than the claw. Ovary pilose, with a stipe ca. 3 mm long. Pods with a stipe ca. 4 mm long, ellipsoid, ca. 12-13 mm long, ventrally carinate, dorsally sulcate, covered with long, soft, white hairs mixed with short spreading black hairs, fully bilocular.

Specimens seen:

Azarbayejan: Between Zanjan to Mianeh, 1200 m, *Sabeti 15643* (TARI); Between Zanjan to Mianeh, 1200-1800 m, 10.5.1973, *Sabeti 15442* (TARI); Mianeh to Zanjan (Khorabad), 1000 m, 3.7.1973, *Sabeti 15062* (TARI); Urmiyeh, Mahabad road, 23.7.1974, *Siami 5330* (TARI), Urmiyeh, Golamz village, 16.5.1981, *Tarighi & Farbodnia et al. 1335* (TARI); Urmiyeh, Ghoyondaghi, 22.5.1971, *Siami 5405* (TARI); Urmiye, Talatappeh road, 23.5.1981, *Tarighi & Amini 1341* (TARI); Urmiyeh lake road Bizu village, *Tarighi & al.* (TARI); Hills S of Tabriz, 14.6.1928, *Gilliat-Smith 2269* (K).

Tehran: Arak, Tafresh, Valadabad, 1800 m, 8.6.1974, *Amini & Bazargan 18705, 18706* (TARI); 7 km from Khomain to Golpayegan, 1810 m, 18.5.1979, *Babakhanlou & Dini 8849* (TARI); 103 km from Hamadan on the road to Ghazvin, 2170 m, 26.6.1974, *Assadi & Shirdelpur 13205* (TARI); between Arak and Khomain, Varche village, 2050 m, *Mozaffarian & Massoumi 48019* (TARI).

Hamadan: Avadje, Sultan-Bulagh, mts., 2000-2400 m, 12.5.1987, *Maassoumi & Mirhosseini 59378* (TARI); Ab-e garm, Asiab to Ildorejin, 1700-2200 m, 15.6.1978, *Massoumi & Mirhosseini 59416* (TARI).

63. Astragalus vessalae Maassoumi & Podlech in Iran. J. Bot. 4: 88. 1988. **Holotype:** Tehran, ca. 71 km of Kazvin, near Noudehak, 1250 m, *Moussavi & Amini 15370* (TARI!).

Fig.: **MAASOUMI** & PODLECH, l.c.: 89 (habit); MAASSOUMI, A.A., 1990, Illustr. guide gen. Astrag. Iran 1: plate 95 (habit); - pages 221 (indument of peduncle and pods) and 227 (flower dissection).

Plants ca. 30 cm tall, caulescent. Stem ascendent, ca.25 cm long and 5 mm thick, covered with short hairs 0.8-1 mm long, internodes of stem ca. 6 mm long. Stipules greenish, deltoid, 10-12 mm long, ciliate at the margin or pilose towards the tip, at a length of ca. 2-3 mm adnate to the petiole and free from one another. Leaves 12-16 cm long, petiole 2-5 cm, long, both petiole and rachis sulcate, hairy. Leaflets 7-9 pairs, elliptic or obovate, 10-16 mm long and 7-

12 mm broad, at the tip rounded or slightly emarginate, upper side glabrous or with scattered subpatent hairs, lower side densely covered with appressed hairs. Inflorescence axillary, a dense spike, peduncle ca. 10 cm long, covered with white hairs or mixed with black hairs, flower numerous. Bracts membraneous, linear, ca. 5 mm long, pilose. Calyx 12 mm long, tubular, densely covered with spreading hairs ca. 1,5 mm long, the teeth subulate, ca. 4 mm long. Corolla violet or blue. Standard ca. 17 mm long, the limb narrowly rhomboid, ca. 7 mm broad, at the tip incised or bilobate, at the base narrowly cuneate. Wing-petals ca. 15 mm long, the limb oblong, at the tip slightly emarginate, at the base auriculate, auricle ca. 1 mm long, the claw two times longer than the limb. Keel ca. 14 mm long, the limb oblong, curved, the tip rounded, the claw 1,5 times longer than the limb. Ovary pilose, shortly stipitate, stipe ca. 1 mm long.

Specimen seen:

Tehran: Ca. 71 km of Kazvin, near Noudehak, 1250 m, *Moussavi & Amin 15370* (TARI).

27. Astragalus macrostachys group

Plants caulescent, with developed stem. Leaflets linear. Inflorescence an axillary spike. Flowers violet. Standard rhomboid, ligulately attenuate toward the apex. Pods stipitate.
Astragalus macrostachys, A. pseudomacrostachys.

64. Astragalus macrostachys DC., Prodr. 2: 286. 1825. **Typus:** Armenia, *Tournefort* (non vidi).
= *A. shahpouricus* Parsa, Fl. Iran 9: 29. 1966. **Typus:** Azarbayejan: Alpin region of NW Shahpoor, 25.5.1957 (K!).

Fig.: MAASSOUMI, A.A., 1990, Illustr. guide gen. Astrag. Iran 1: plate 89 (habit); - pages 217 (indument of peduncle and pods) and 226 (flower dissection).

Plants with developed stem, 30-45 cm tall. Stipules triangular-acuminate, ca. 6 mm long, in lower part glabrous, upper part densely covered with black and white hairs or sometimes exclusively covered with black hairs, at a length of ca. 2 mm adnate to the petiole. Leaves 10-13 cm long, petiole very short, ca. 1-2 cm, densely vested with appressed hairs or predominantly mixed with black hairs. Leaflets 13-14 pairs, linear, complicate, 10-20 mm long and 2-4 mm broad, both sides covered with appressed hairs. Inflorescence axillary, a dense spike 5-15 cm long, elongating in fruit, peduncle equaling or slightly longer than the leaves, 7-20 cm long densely covered with short appressed white hairs or below the inflorescence mixed with short black hairs. Bracts linear, ca. 2 mm long, with black and white hairs. Calyx tubular, ca. 8 mm long, covered densely with black and white hairs, the teeth setaceous, 2-3 mm long. Corolla dark violet. Standard rhomboid, ca. 16 mm long, ca. 4-5 mm broad, ligulate-attenuate toward the apex, emarginately tipped or bilobate. Wing-petals ca. 15 mm long, the limb elliptic, round tipped, with an auricle ca. 1 mm long, equaling the claw. Keel, ca. 14 mm long, the limb oblique-elliptic, ca. 1,5 times shorter than the claw. Ovary pilose, stipitate, stipe ca. 2 mm long. Pods with a stipe ca. 6 mm long, ellipsoid, ca. 16-18 mm long, ventrally carinate, dorsally sulcate, terminating in a subulate beak, ca. 4 mm long, vested with long white or yellowish hairs, densely mixed with short spreading black hairs, fully bilocular.

Notes: The specimen *Rechinger 41790* with the yellow corolla and very short flowers seems to be a separate taxon.

Specimens seen:

Azarbayejan: 33 km to Shahpur on road from Khoy, 1500 m, 30.6.1978, *Assadi & Mozaffarian 30497* (TARI); 43 km from Tabriz to Marand (before Payam), 1650 m, 26.6.1986, *Maassoumi & Abouhamzeh 56983* (TARI); 30 km after Makou on road to Borolan, 1650 m, 28.6.1982, *Akbarzadeh & Salari 41179* (TARI); 24 km from Khoy on the road to Ghara Tappeh, 1550 m, 13.6.1972, *H. Foroughi 6253* (TARI); 27 km from Salmas to Uroumieh (Ghosh-Chineck), 1650 m, 26.6.1986, *Maassoumi & Abouhamzeh 57011* (TARI); 15-22 km from Khoy to Salmas, 1340 m, 26.6.1986, *Maassoumi & Abouhamzeh 56992* (TARI); Uroumieh, 6 km from Roshan diviation (after Silvana), 1630 m, 27.6.1986, *Maassoumi & Abouhamzeh 57029* (TARI); Uroumieh, Gushchi pass, 6.8.1982, *Sianii 5306* (TARI); Khoy, Gharah-Tappeh, 1500 m, 10.6.1975, *Amini 1548, 1448, 1556* (TARI); Khoy, ghotur road habash, 2400 m, 15.6.1975, *Amini 1557* (TARI); Uroumieh, Ghasemlu valley, 25.6.1972, *Sabeti 5335* (TARI); Near Khoy, Haji Aldin mountain, 1450-1850 m, 30.6.1978, *M. Assadi & V. Mozaffarian 30422* (TARI); 30 km S Khoy, versus Shahpur, 1500 m, 12.6.1971, *Rechinger 41790 ?* (W).

65. Astragalus pseudomacrostachys Maassoumi sp. nov.

Holotypus: Azarbayejan: Rezaiyeh, Ile de Kaboudan, 4.6.1978, 1300-1600 m, *Matin & Daneshpajouh 38378* (EVIN!).

Similar to *A. macrostachys* DC. but it differs in having short sessile ovaloid fruits, (not ellipsoid, long stipitate). Standard rhomboid, subacute (not ligulate-attenuate), stem densely covered with short appressed hairs (not glabrous).

Fig.: MAASSOUMI, A.A., 1993, Illustr. guide gen. Astrag. Iran 2: plate 91 (habit); - pages 220 (indument of peduncle and pods) and 226 (flower dissection).

Plantae perennes, caulescentes, ca. 30 cm altae, caule ca. 5-11 cm longo. Stipulae lanceolatae, acuminatae, ca. 10 mm longae, albi-nigri-pilosae, basi per ca. 2 mm petiolo adnatae, inter se connatae. Folia 8-18 cm longa, petiolo 3-5 cm longo, sicut rachis sparse longe et brevissime appresse piloso. Foliola 12-15 juga, anguste elliptica, 7-9 mm longa et 3-4 mm lata, supra in parte mediano glabra, marginem versus sparse pilosa, subtus appresse pilosa. Inflorescentiae axillares, elongatae, pedunculo ca. 14 cm longo, appresse piloso suffultae. Bracteae 6-8 mm longae, lineares, albi-nigri-pilosae. Calyx 12-13 mm longus, albi-nigri-pilosus, dentibus linearibus ca. 3 mm longis. Corolla flava. Vexillum ca. 21 mm longum, lamina rhomboida, breviter ligulata, apice rotundatum. Alae ca. 18 mm longae, lamina anguste elliptica, antice rotundata, basi auriculata ca. 1 mm longa provisa. Carina 15 mm longa, lamina triangulare. Ovarium pilosum. Legumen ovoideum, sessile, ca. 8 mm longum et 4 mm latum, apice rostratum, rostro curvato ca. 3 mm longo, ventro carinatum, dorso applanatum, longe et brevissime patenter pilosum,complete biloculare.

28. Astragalus podocarpus group

Plants caulescent, with developed stem. Leaflets linear. Inflorescence an axillary spike. Flowers yellow. Standard obovate. Pods stipitate.
Astragalus podocarpus.

66. Astragalus podocarpus C.A. Mey., Verz. Pfl. Cauc.: 142. 1831. **Typus:** Talysch, in campis et agris montosis provinciae Talysch prope pagum Suwant, *C.A. Meyer* (LE) non vidi.

= *A. podocarpus* C.A.Mey. var. *leucotrichus* Bornm. & Gauba in Repert. Spec. Nov. Regni Veg. 39: 100. 1935. **Typus:** Persia borealis: Montes Elburs Centralas; in valle fluvii Keredj prope Sirah, 2300 m, *Gauba 625* (non vidi).

Fig.: MAASSOUMI, A.A., 1990, Illustr., guide gen. Astrag. Iran 1: Plate 91 (habit); - pages 217 (indument of peduncle and pod) and 226 (flower dissection).

Plants caulescent, ca. 50-60 cm tall. Stipules small, 3-4 mm long, pilose, at the base free from the petiole and shortly jointed to one another. Leaves 7-8 cm long, petiole short, 1-2 cm long, petiole and rachis densely covered with white appressed hairs or rarely mixed with some scattered black hairs. Leaflets 5-6 pairs, linear, ca. 25 mm long and 2 mm broad, acute at the tip, cuneate at the base, complicate, both sides covered with appressed hairs. Inflorescence dense, ovaloid or capitate, flowers numerous, peduncle ca. 7-8 cm long, covered with white hairs or sometimes mixed with black hairs. Calyx 6-8 mm long, tubular, covered with villous white and black hairs, the teeth subulate, ca. 2 mm long, Corolla yellow. Standard ca. 15 mm long, the limb obovate or orbicular, emarginately tipped or bilobed. Wing-petals ca. 13 mm long, the limb elliptic, dilated toward the apex, rounded at the tip or very rarely emarginate, at the base auriculate, claw equaling the limb. Keel ca. 11 mm long, the limb oblique-elliptic or curvate, claw equaling the limb. Ovary pilose, stipitate, stipe ca. 1 mm long. Pods with a stipe ca. 1 mm long, ovaloid, ca. 10 mm long and 3 mm broad, terminating in a recurved beak, ventrally rounded, dorsally sulcate, densely covered with long hairs, mixed with spreading short white hairs, fully bilocular.

Specimens seen:

Mazandaran: Kandavan, Chalus valley, 2780 m, 21.7.1971, *H. Foroughi 2196* (TARI).

Azarbayejan: 40 km from Namin to Germi Pilleh-Chay region, neck mountain between Pillcho and Fatmeh Soul, 1900 m. 21.6.1980, *Nowroozi & Mozaffarian 36418* (TARI); 45 km from Namin to Germi, 20.6.1980 *Mozaffarian & Nowroozi 34613* (TARI); 2 km NE of Khalkhal, 1800-2050 m, 16.6.1980, *Mozaffarian & Nowroozi 34058* (TARI); 78 km from Mianeh to Khalkhal (after Firouzabad), 1500 m, 20.6.1986 *Maassoumi & Abouhamzeh 56893,* (TARI); 28 km from Kivi, 8 km from Senjebid to Piraghaj, 1650 m, 17.6.1980, *Mozaffarian & Nowroozi 34284* (TARI); Zanjan to Mianeh (Shur Qesh-Laq), 1000 m, 2.5.1973, *Sabeti 15495* (TARI); 35 km from Ardabil to Germi, 21 km to Sadafarin region, 1650 m, 23.6.1986, *Maassoumi & Abouhamzeh 56951* (TARI).

Hamadan: Kuh-e Alvand, 2700 m, *Assadi & Mozaffarian 36816* (TARI).

III. Subsect. Bornmuelleriana (Sirj. & Rech.f.)Maassoumi, comb. nov.

= Sect. *Bornmuelleriana* Sirj. & Rech. f. in Repert. Spec. Nov. Regni Veg. 52: 15. 1943- **Lectotype**: *A. anserinaefolius* Boiss. (PODLECH in Mitt. Bot. Staatss. München 29: 466. 1990).

Plants caulescent. Leaflets imbricate or complicate. Inflorescences axillary, densely spicate, or elongated. Bracts linear. Calyx campanulate or funnel-shaped, the teeth setaceous, as long or somewhat longer than the tube. Corolla violet or yellow. Standard elliptic. Pods elliptic, densly lanate.

29. Astragalus anserinaefolius group

Plants caulescent or nearly acaulescent. Flowers violet or yellow. Calyx teeth setaceous, as long as the tube. Standard limb oblong-elliptic.
Astragalus anserinaefolius, A. laristanicus, A. termeanus, A. ghahrmanii.

67. Astragalus anserinaefolius Boiss., Diagn. Pl. Or. Nov. 2: 76. 1843; **Type:** In desertis sinum persicum, *Aucher-Eloy 4410* (FI!, W!).
= *A. kermanicus* Parsa, Fl. Iran 9: 113. 1966. **Holotype:** Kerman, 28.7.1957, *Parsa ?* (K!).

Fig.: Maassoumi, A. A., (1990) Illus Guide Gen. Astrag. Iran, vol. 1, Plate 79 (habit); - pages 217 (peduncle and pod indumentum) and 226 (flower dissection).

Plants 10-35 cm tall, with developed stems. Stipules ca. 2-3 mm long, pilose, free from one another and the petiole. Leaves ca. 3 mm long, petiole 0,5-1 cm, both petiole and rachis covered with appressed or subpatent hairs. Leaflets 9-10 pairs, contiguous, complicate, obovate, ca. 5 mm long and 4 mm broad, both sides covered with appressed hairs. Inflorescences axillary, spherical or elliptic in flowering, elongated in fruit, flowers numerous, peduncle ca. 7 cm long, covered with short appressed hairs. Bracts linear, ca. 2 mm long, pilose. Pedicels ca. 1 mm long, pilose. Calyx campanulate or shortly tubular, at the base gibbous, ca. 10 mm long, covered with white hairs, rarely with some scattered black hairs, the teeth subulate, ca. 5 mm long. Corolla yellow or pale violet. Standard ca. 14 mm long, the limb elliptic, emarginate at apex. Wing-petals ca. 12 mm long, the limb narrowly elliptic, dilated toward the apex, round-tipped, at the base auriculate, equaling the claw. Keel ca. 11 mm long, the limb oblique-elliptic, equaling the claw. Ovary pilose, sessile. Pods ca. 9 mm long and 4 mm broad, covered with spreading long soft white hairs, bilocular.

Specimens seen:

Esfahan: 37 km SE Nain, 1300 m, 11.5.1961, *Pabot 7088 (28545)* (TARI); 30 km SE of Nain, *Babakhanlou, 23043* (TARI).
Fars: 40 km SE Abadeh, 1900 m, 26.4.1961, *Pabot 5826 (28544)* (TARI); 33 km from Lar to Bastak, Mountains SE of the village Hormud, 800-1100 m, 17.4.1983, *Assadi & Sardabi 41835* (TARI).
Hormozgan: 28 km N Hajiabad, 1180 m, 6.5.1961, *Pabot 6768 (28546)*, (TARI).
Kerman: inter Saidabad (Sirdjan) et Jugum Cah Coughuk (Cafut), ca. 1700-1900 m, 6.5.1948, *Rechinger, Aellen, Esfandiari 3136* (W, Evin); between Mahan and Kerman, ca. 1900 m, 6.5.1977, *Assadi 23283* (TARI); inter Barsir et Kerman, 9.6.1960, *Dadashzadeh (28543)*, (TARI); 130 km from Bam on the road to Kerman, 2100 m, 5.5.1977, *Assadi 23234* (TARI); 27 km from Ahar to Yazd, 1500 m, 4.6.1986, *Assadi & Bazgosha 56466* (TARI); Darzin, 6 km on the road to Jiroft, 1450 m, 4.4.1975, *Foroughi 15903* (TARI); 20,4 km N of Hajiabad, 150 km S Sirjan, 1100 m, 6.5.1961, *Pabot 6742* (TARI); hills S of Deh-Bakri, 1150-1700 m, 1.5.1975, *Paris 75.262* (K); 55 km N of Ardestan, 15.5.1961, *Zohary & Orshan 60-4914* (HUJ).

68. Astragalus laristanicus Bornm. & Gauba in Feddes Repert. Sp. Nov. Regni Veg. 50: 157. 941. **Holotype:** Persia australis, Laristan, in steppis aridis inter Lar et Hormud, 700 m, *Gauba 941* (B) n.v.
= *A. kourosianus* Parsa in Kew Bull. 1947: 19 (1947); **Holotype:** Persia, Lar, Hormud, *Parsa 670* (Faculty of Pharmacy, Tehran!).
= *A. anserinaefolius* Boiss. var. *elegantifolius* Parsa, Fl.Iran 9: 38. 1966. **Lectotype:** Sirjan, III.- IV.1956, *Parsa ? 200/0* (K!).

Fig.: Maassoumi, A. A., 1993, Illus. Guide gen. Astragalus Iran, vol. 2 plate 78 (habit); - pages 217 (peduncle and pods indumentum) and 226 (flower dissection).

Plants caulescent, 17-25 cm tall. Stipules ca. 8 mm long, lanceolate, covered with black and white hairs, abruptly attenuate towards the tip, at a length of ca. 2 mm adnate to the petiole and free from one another. Leaves ca. 5-6 cm long, petiole ca. 1-2 cm long, densely covered with short spreading hairs. Leaflets ca. 10 pairs, complicate, ovate, ca. 6 mm long and 2-3 mm broad, upper side glabrous or ciliate at the margin, lower side covered with appressed hairs. Inflorescence at first densely capitate, gradually becoming elongated, peduncle 7-8 cm long, covered with short appressed hairs, below the inflorescence mixed with black hairs. Pedicels 1-2 mm long, pilose. Bracts linear, ca. 7 mm long, covered with black and white hairs. Calyx tubular or campanulate, ca. 13 mm long, covered with black and white hairs, the teeth setaceous ca. 6 mm long. Corolla pink or violet. Standard ca. 18-19 mm long, the limb elliptic, at the apex emarginate, at the base near the claw constricted. Wing-petals ca. 16 mm long, the limb elliptic, round tipped, at the base auriculate, the claw slightly longer than the limb. Keel ca. 12-13 mm long, the limb elliptic, curved, the claw 1.5 times longer than the limb. Ovary pilose. Pods ca. 16 mm long and 5 mm broad, ventrally rounded, dorsally slightly sulcate, covered with long silky soft hairs, fully bilocular.

Specimens seen:

Hormozgan: ca. 100 km SE of Lar, near the village Sartang, 300 m, 19.4.1983, *Assadi & Sardabi 41942* (TARI); 111 km from Bandar-Abbas to Sirjan, after the tunnel, 1000 m, 21.4.1983, *Assadi & Sardabi 42223* (TARI).
Baluchestan: Sarbaz, 74 km Zabol road, 1280 m, 11.3.1974, *Foroughi 10790* (TARI).

69. Astragalus termeanus Maassoumi & Podlech in Iran. J. Bot. 4: 87. 1988.
Holotype: Baluchestan, 150 km S of Zahedan on road to Khash, 1500 m, 24.4.1983, *Termeh, Moussavi & Tehrani 41110-E* (Evin!; Iso: W!).

Plants with a branched caudex. Stems 2-6 cm long, covered with appressed white hairs. Stipules membranous or greenish, ca. 4-5 mm long, acute, triangular, free from one another, at a length of 1-3 mm adnate to the petiole, covered with isolated white hairs or mixed with black hairs. Leaves 4-10 cm, petiole 1-3 cm long, both petiole and rachis covered with appressed hairs 0.5-0.8 (-1) mm long, in the upper part with isolated hairs 1-2 mm long. Leaflets 8-12 pairs, elliptic, 4-11 mm long and 1.5-3 mm broad, at the tip acute, upper side glabrous or with scattered hairs, lower side covered with subpatent or appressed strigous hairs, leaflets complicate. Inflorescence axillary, capitate at first, elongate in fruiting, ca. 12 cm long with many flowers, peduncle 3-10 cm long, sulcate, in the lower part with white hairs and towards the upper part more and more mixed with black hairs. Bracts membranous, 6-10 mm long, subulate, covered with black and white hairs. Pedicels 1.5-2.5 mm long, with subpatent hairs. Calyx ca. 13-15 mm long, tubular, covered with spreading hairs, the teeth linear or subulate, greenish, 6-8 mm long, equaling the tube or slightly longer. Corolla pink or violet. Standard 16-21 mm long, the limb narrowly elliptic, 5-9 mm broad, round-tipped. Wing-petals 15-19 mm long, the limb narrowly oblong, round-tipped, at the base with a small auricle, claw equaling the limb. Keel 13-14 mm long, the limb triangular-elliptic, claw 1,5 times longer than the limb. Ovary shortly stipitate, pilose. Pods elliptic, ca. 10-12 mm long, 4.5-5 mm broad, and 4 mm high, ventrally carinate, dorsally sulcate, bilocular.

Specimens seen:

Baluchestan: Saravan, Mahouk, 9.4.1950, *Salavation 5599 E.* (Evin); E of Khash, 28.3.1973, *Sojak 2125* (PR), 40 km W of Saravan, near suran, 30.3.1973, *Sojak 688* (PR); 31 km SW of Espakeh, 10.4.1973, *Sojak 1680* (PR); 5-10 km N of Khash, 1300 m, 25.4.1983, *Termeh, Moussavi & Tehrani 41113 E* (Evin); 18 km S of Khash, on the road to Iranshahr, 1320 m, 28.4.1983, *Termeh, Moussavi & Tehrani 41093 E* (Evin).

70. Astragalus ghahremanii Maassoumi & Podlech in Iran. J. Bot. 4: 76. 1988. **Holotype:** Baluchestan, Saravan to Dehak, 13.3.1974, *Iranshar 16344* (Evin!; Iso: W!).

Fig.: Page 226 (flower dissection).

Plants acaulescent or with a short stem, covered with more or less spreading hairs. Stipules greenish, 3-6 mm long, triangular, pilose, free from one another and shortly adnate to the petiole. Leaves 4-8 cm long, petiole equaling the limb or shorter, covered with appressed or subpatent hairs ca. 1,5 mm long. Leaflets 6-8 pairs, elliptic, 2-6 mm long, and 1,5-4 mm broad, at the tip obtuse, upper side toward the margin and lower side densely covered with appressed hairs. Inflorescence axillary, capitate at first, becoming loose in fruit and up to 10 cm long, peduncle ca. 6-9 cm long, pilose, flower numerous. Bracts ca. 3-4 mm, greenish, acuminate. Calyx ca. 12-13 mm long, tubular, covered densely with spreading hairs, the teeth linear or subulate, more or less equaling the tube. Corolla violet. Standard ca. 15-16 mm long, the limb elliptic, 7-9 mm broad, round tipped or slightly retuse or emarginate. Wing-petals 14-15 mm long, the limb elliptic, at the base auriculate, auricle ca. 1 mm long, claw equaling the limb. Keel ca. 11-12 mm, the limb oblique-elliptic or slightly curved, acute, at the base shortly auriculate, claw longer than the limb. Ovary sessile, pilose, style glabrous. Pods (immature) sessile, elliptic, ca. 10 mm long, covered with long strigous hairs.

Specimens seen:

Baluchestan: Saravan to Dehak, 13.3.1974, *Iranshahr & Ershad 1634 E* (Evin); 91 miles SE of Khash on the road to Sarvan 4000 ft., 17.3.1971, *Grey, Wilson & Hewer 190* (W).

Doubtful species

During this work *A. kendewanensis* Gilli, described as belonging to sect. *Malacothrix* was not seen. The description is incomplete, but according the field experience this taxon does not belong to the sect. *Malacothrix.* I suppose that this curious plant belongs to the the sect. *Alopecuroidei* DC. Perhaps this species is a young plant of *A. ajubensis* Bge. or *A. jesseni* Bunge, which are widely distributed in the central Albourz (Kendewan mountains).

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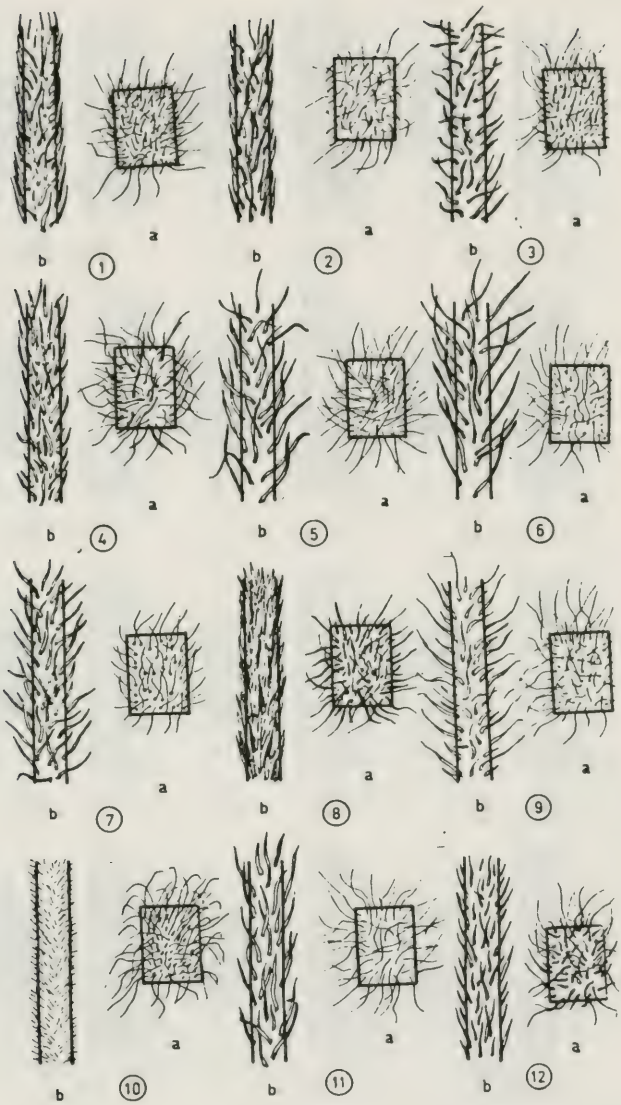

Fig. 1. Indument of pods (a) and peduncles (b)

1. *A. macrourus* (62056) - 2. *A. macrostachys* (57041) - 3. *A. eriopodus* (43134) - 4. *A. podocarpus* (2196) - 5. *A. senilis* (8515) - 6. *A. deickianus* (59384) - 7. *A. pulchellus* (17374) - 8. *A. spachianus* (39804) - 9. *A. chrysotrichus* (15541,74) - 10. *A. laristanicus* (41942) - 11. *A. anserinifolius* (41835) - 12. *A. kabristanicus* (57005)

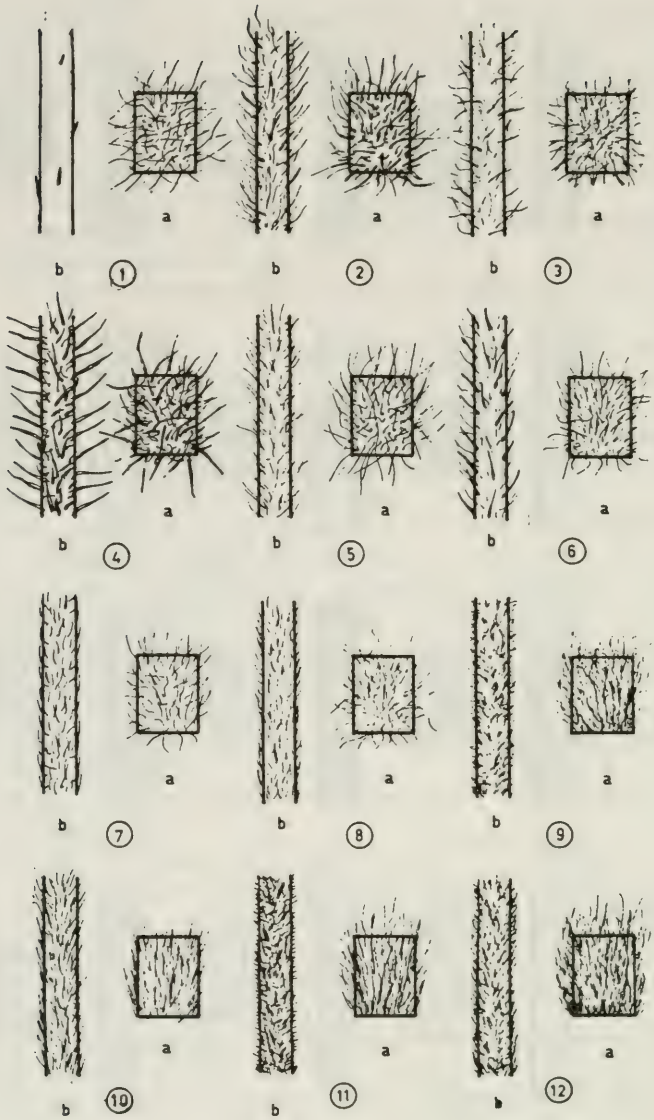

Fig. 2. Indumentum of pods (a) and peduncles (b)

1. *A. holopsilus* (62085) - 2. *A. heterodoxus* (58049) - 3. *A. griseus* (17691) - 4. *A. mollis* (47794) - 5. *A. rawlinsianus* (12873) - 6. *A. suluklensis* (50756) - 7. *A. takhtadzhani* (34164) - 8. *A. plebejus* (57394) - 9. *A. melanodon* (31226) - 10. *A. beckii* (32851) - 11. *A. tenuiscapus* (46164) - 12. *A. melanodon* (31241)

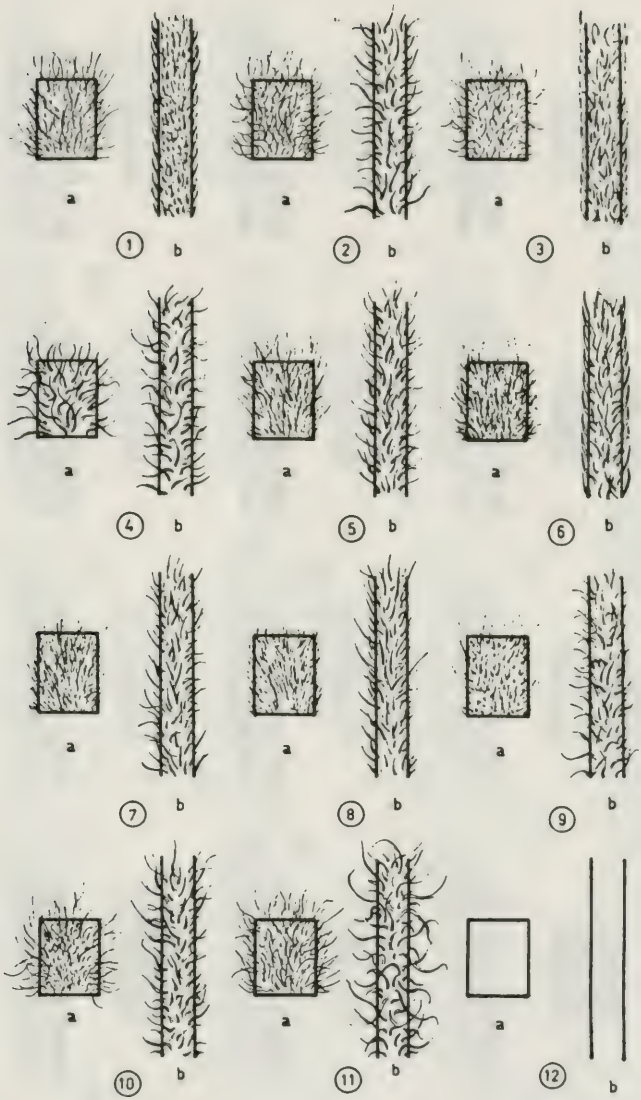

Fig. 3. Indumentum of pods (a) and peduncles (b)

1. *A. rudimentus* (Iso., s.n.) - 2. *A. belgheisensis* (Holo., 64843) - 3. *A. inclinatus* (Holo., s.n.) - 4. *A. rusticus* (Holo., 233) - 5. *A. patrius* (Holo., 51297) - 6. *A. babakhanloui* (Holo., 48083) - 7. *A. glochidiatus* (Iso., s.n.) - 8. *A. chahartaghensis* (Holo., 59968) - 9. *A. pseudopulchellus* (Holo., 48087) - 10. *A. inexpectatus* (Holo., 1287) - 11. *A. expectatus* (Holo., 45716)

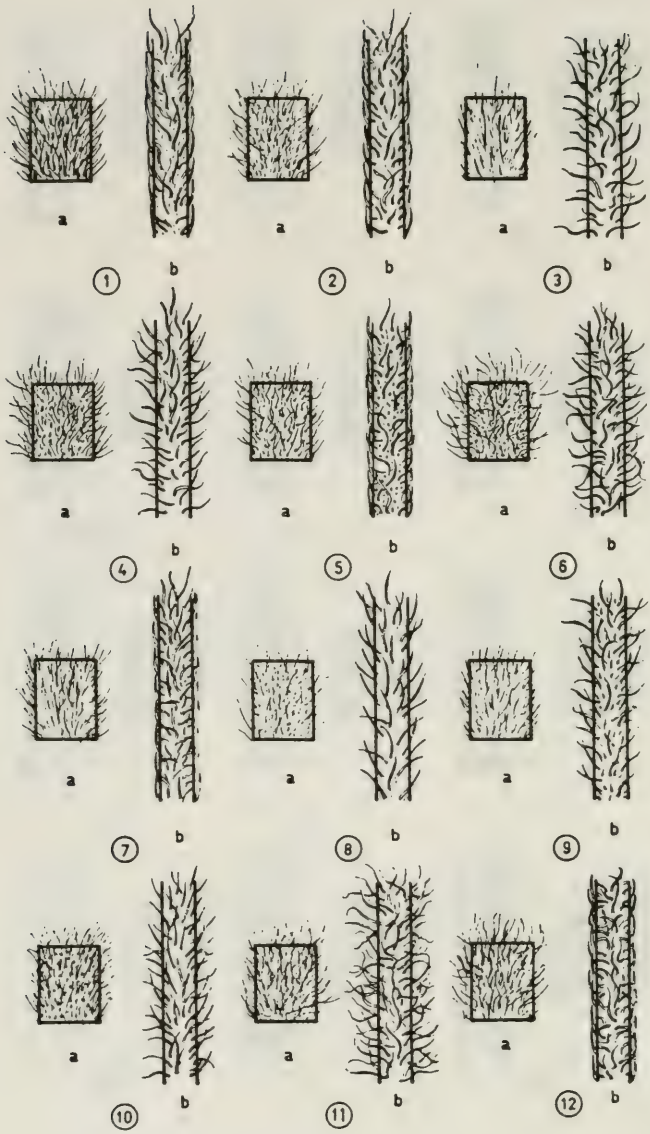

Fig. 4. Indumentum of pods (a) and peduncles (b)

1. *A. idomitus* (Holo., 30771) - 2. *A. galbineus* (Holo., 9692) - 3. *A. nahavandicus* (Holo., 59365) - 4. *A. rivashensis* (Holo., 35057) - 5. *A. daghdaghabadensis* (Holo., 64502) - 6. *A. hendelanicus* (Holo., 64907) - 7. *A. lippertii* (Holo., 6313) - 8. *A. pseudomacrostachys* (Iso., 38378) - 9. *A. leucothrichus* (Holo., 1026) - 10. *A. memnonius* (Holo., 8572) - 11. *A. canosus* (Holo., 11981) - 12. *A. leushanensis* (Holo., 60356)

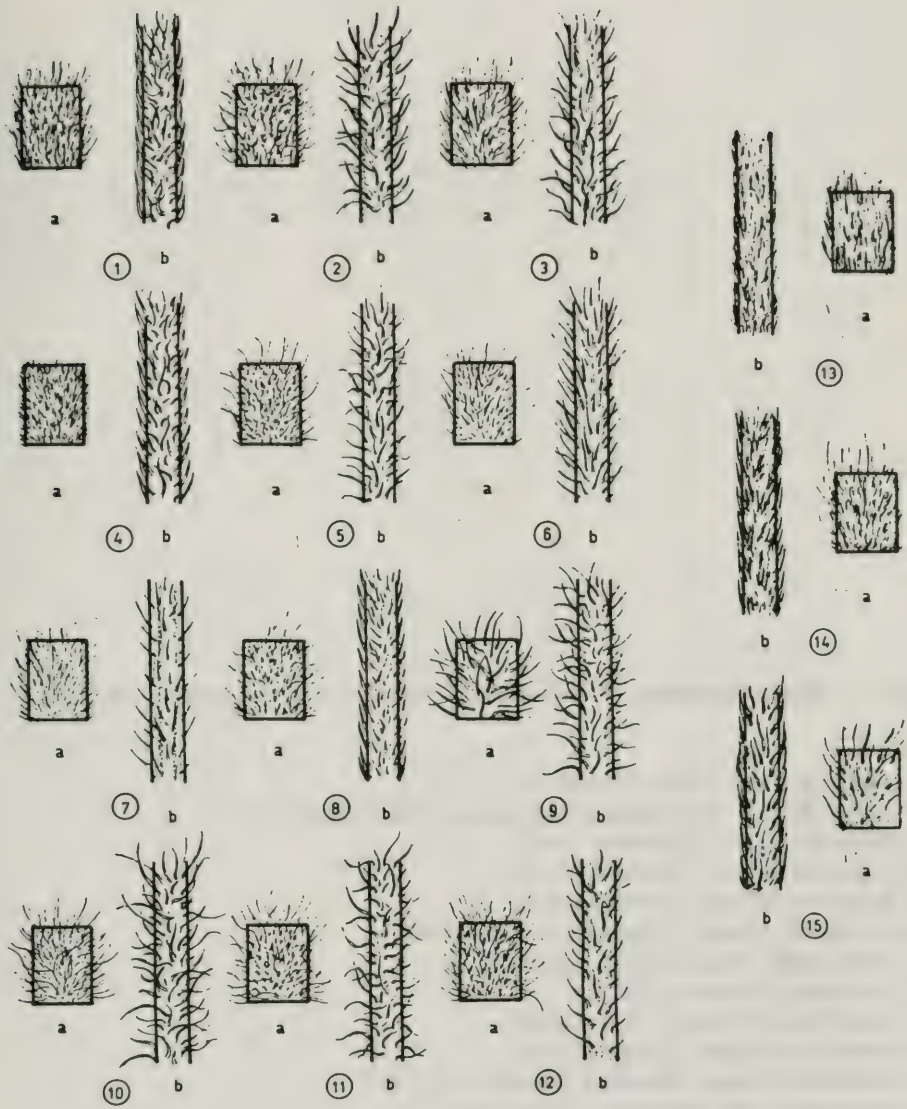

Fig. 5. Indumentum of pods (a) and peduncles (b)

1. *A. idoneus* (Holo., 27540) - 2. *A. caligineus* (Holo., 54709) - 3. *A. inoblitus* (Holo., 56963) - 4. *A. birangae* (Holo., 24) - 5. *A. pseudoantilibani* (Holo., 34491) - 6. *A. khajiboulaghensis* (Holo., 34683) - 7. *A. typhaeformis* (Holo., 13372) - 8. *A. alamouticus* (Holo., 51047) - 9. *A. vessalae* (Holo., 15370) - 10. *A. capillatus* (Holo., 54615) - 11. *A. perdurabilis* (Holo., 12872) - 12. *A. ghoortapacensis* (Holo., 4307) - 13. *A. pauperiflorus* (7496) - 14. *A. elegans* (56960) - 15. *A. eugenii* (6258)

Fig. 6. Flower dissections: A = standard; B = wing-petals; C = keel (nat. size)

1. *A. senilis* Bornm. (Majda Zhumer 493)
2. *A. senilis* Bornm. (Khatamsaz, Maassoumi & Abouhamzeh 52104)
3. *A. pulchellus* Boiss. (Jacobson 6198)
4. *A. pulchellus* Boiss. (Foroughi 17374)
5. *A. deickianus* Bornm. (Maassoumi 59333).
6. *A. deickianus* Bornm. (Wendelbo & Assadi 16887)
7. *A. inexpectatus* Maass. & Podl. (Hol.)
8. *A. inclinatus* Maassoumi (Hol.)
9. *A. pauperiflorus* Bornm. (Riazi 7496)
10. *A. rudimentus* Maass. (Terme 13325E)
11. *A. melanodon* Boiss. (Assadi & Mozaffarian 31241)
12. *A. tenuiscapus* Frey. & Bornm. (Sojak 6454)
13. *A. griseus* Boiss. (Wendelbo & Foroughi 17691)
14. *A. holosemius* (Aucher Eloy 4418)
15. *A. beckii* Bornm. (Bornmüller 6770 Hol.)
16. *A. beckii* Bornm. (Maassoumi 55108)
17. *A. rusticus* Maass. (Hol. 233)
18. *A. patrius* Maass. (Assadi & Massoumi 51297, Hol.)
19. *A. plebejus* Boiss. (Riazi 9108)
20. *A. babakhanloui* Maass. & Podl. (Mozaffarian & Maassoumi 48083, Hol.)
21. *A. chahartaghensis* Maassoumi & Podl. (Mozaffarian 59968, Hol.)
22. *A. capillatus* Maassoumi (Mozaffarian 54615, Hol.)
23. *A. iranicus* Bge. (Th. Kotschy 297)
24. *A. iranicus* Bge. (Shahrud)

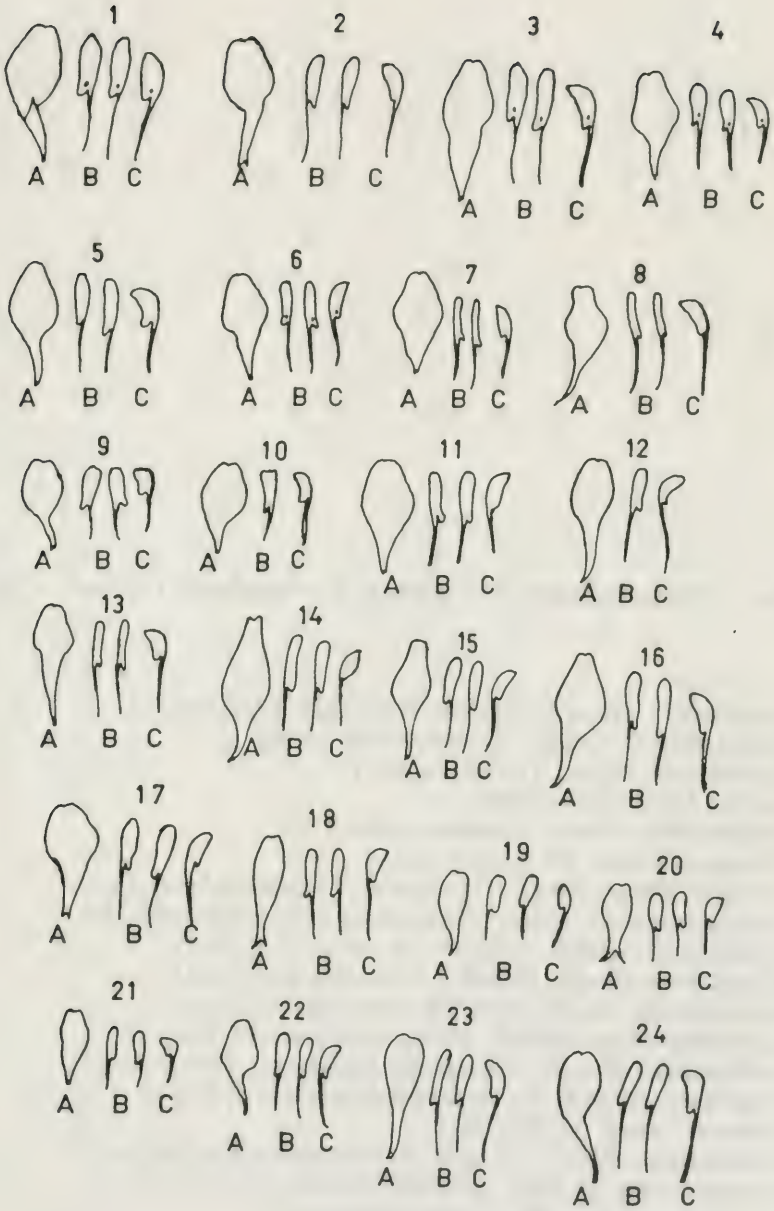
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Fig. 7 Flower dissections: A = standard; B = wing-petals; C = keel (. nat. size)

1. *A. perdurabilis* Maass. (Wendelbo & Foroughi 12872, Hol.)
2. *A. ghoortapacensis* Maass. (Nowroozi 4307, Hol.)
3. *A. glochidiatus* Maass. (Terme, s.n. Hol.)
4. *A. mollis* M.B. (Steven, ISO.)
5. *A. belgheisensis* Maass. (Maassoumi 64843, Hol.)
6. *A. birangae* Maass. (Youssefy 24, Hol.)
7. *A. pseudoantilibani* Maass. (Mozaffarian & Nowroozi 34491, Hol.)
8. *A. khajiboulaghensis* Maass. (Mozaffarian & Nowroozi 34683, Hol.)
9. *A. typhaeformis* Maass. (Wendelbo & Assadi 13372, Hol.)
10. *A. alamouticus* Maass. (Assadi & Maassoumi 51047, Hol.)
11. *A. leucothrichus* Maass. (Fattahi & Khaledian 1026, Hol.)
12. *A. memonius* Maass. & Podl. (Dini & Bazargan 8572, Hol.)
13. *A. takhtadzhani* Grossh. (Mozaffarian & Nowroozi, 34174)
14. *A. suluklensis* Freyn & Sint (Assadi & Maassoumi, 50372)
15. *A. canosus* Maass. (11981, Hol.)
16. *A. leushanensis* Maass. (Assadi & Shah-Mohammadi 60356, Hol.)
17. *A. idoneus* Maass. & Podl. (Assadi 27540, Hol.)
18. *A. caligineus* Maass. (Mozaffarian 54709, Hol.)
19. *A. inoblitus* Maass. (Maassoumi & Abouhamzeh 56963, Hol.)
20. *A. rawlinsianus* Aitch. & Baker (Maassoumi 47591)
21. *A. indomitus* Maass. (Arazm & Bazargan, 30771, Hol.)
22. *A. galbineus* Maass. (Riazi 9692, Hol.)
23. *A. nahavandicus* Maass. (Maassoumi & Mirhosseini 59365, Hol.)

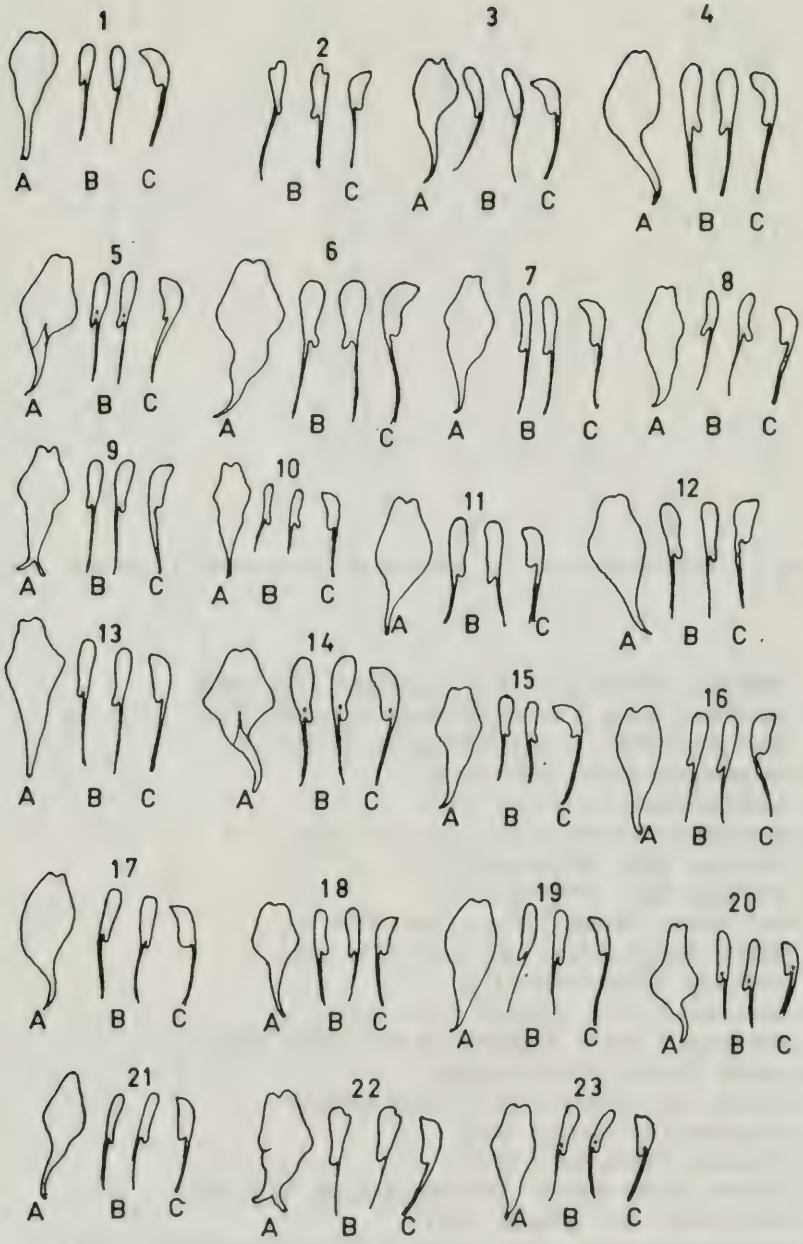
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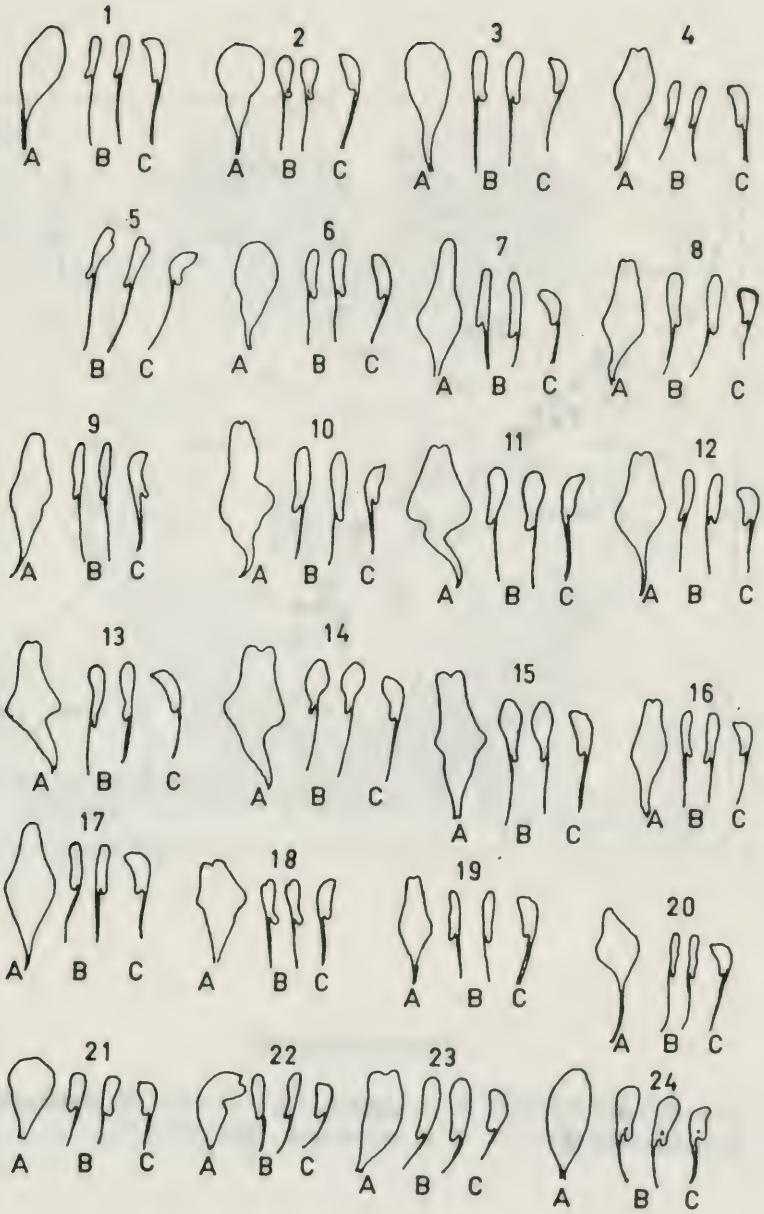
Fig. 8 Flower dissections: A = standard; B = wing-petals; C = keel (· nat. size)

1. *A. rivashensis* Maass. (Assadi & Mozaffarian, 35657, Hol.)
2. *A. spachianus* Boiss. & Buhse (Foroughi & Assadi, 16216)
3. *A. heterodoxus* Bge. (Assadi & Bazgosha, 56148)
4. *A. chrysotrichus* Boiss. (ISO, 4414)
5. *A. daghdaghabadensis* Maass. (Hol.)
6. *A. hendelanicus* Maass. (Maassoumi 64907, Hol.)
7. *A. holopsilus* Bge. (Rechinger, 47387)
8. *A. holopsilus* Bge. (Nowroozi, 3722)
9. *A. kabristanicus* Grossh. (Maassoumi 64894)
10. *A. lippertii* Maass. & Podl. (Foroughi, 6313, Hol.)
11. *A. sarae* Eig (Akbarzadeh, 41133)
12. *A. macrorous* F. & M. (Aucher.-Eloy, 4417)
13. *A. macrorous* F. & M. (Maassoumi & Mirhosseini, 59311)
14. *A. eugenii* Grossh. (Foroughi, 6258)
15. *A. elegans* Bge. (Assadi & Mozaffarian, 30309)
16. *A. eriopodus* (Aucher Eloy, 4422)
17. *A. eriopodus* (Gilliat, Smith, 2269)
18. *A. vessalae* Maass. & Podl. (Moussavi & Amin 15370, Hol.)
19. *A. macrostachys* DC. (Sabeti, 5894)
20. *A. pseudomacrostachys* Maass. (Matin & Daneshpajouh 38378 E, Hol.)
21. *A. podocarpus* (Mozaffarian & Nowroozi, 34284)
22. *A. anserinifolius* Boiss. (Aucher Eloy, 4410, ISO.)
23. *A. laristanicus* Bornm. & Gauba (Manutchehri, 394)
24. *A. ghahremanii* Maass. & Podl. (ISO, 16344)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Distribution map of:

A. senilis ▲
A. melanodon ●
A. pulchellus ○
A. tenuiscapus ✶
A. deickianus ■

Distribution map of:

A. holosemius ■
A. plebeius ●
A. babakhanloui ▲
A. chahartagensis ★

Distribution map of:

A. pauperiflorus ▲
A. rudimentus ■
A. beckii ●
A. griseus ○
A. aspadanus ★
A. saccatus ☆

Distribution map of:

A. mollis ▼
A. khajiboulaghensis ■
A. belgheisicus ●
A. typhaeformis *
A. suluklensis ○

Distribution map of::

A. iranicus ▲
A. ghoortapensis ■
A. perdurabilis ●
A. glochidiatus ✶

Distribution map of:

A. rivashensis ●
A. chrysotrichus ○
A. spachianus ■
A. daghdaghabadensis ★
A. heterodoxus ▲
A. hendelanicus ✱

Distribution map of:

A. rawlinsianus ▲
A. nahavandicus ☆
A. sarae *
A. galbineus ■
A. indomitus ●

Distribution map of:

A. idoneus ■ A. caligineus ▲ A. leushanensis ●
A. inoblitus ☆

Distribution map of:

A. holopsilus ●
A. macrourus ○
A. lippertii ▲
A. kabristanicus ■

Distribution map of:

A. laristanicus ● A. termeanus ■ A. macrostachys ▲

Distribution map of:

A. elegans ▲
A. eriopodus ✶
A. anserinifolius ●
A. podocarpus ■

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Veronica islensis Gamal-Eldin n. sp. from Wadi Isla, Southern Sinai

by

E. M. GAMAL-ELDIN

Abstract:
GAMAL-ELDIN, E.M.: Veronica islensis Gamal-Eldin n.sp. from Wadi Isla, Southern Sinai. - Sendtnera 1: 241 - 244. 1993. ISSN 0944-0178.

A new species of *Veronica* from Sinai is decribed and compared with *V. kaiseri*, which seems to be the nearest relative.

Wadi Isla is situated in the southern part of Sinai Peninsula, 30 km of El-Tor city. It is an isolated, narrow and irregular wadi. It originates west of El-Tor City runs between magmatic mountains and ends in El-Qa valley. The El-Qa valley, between the magmatic massif of lower Sinai Massif District and the Gulf of Suez (DANIN, 1983), represents an extremely arid area which is very poor in species. In constrast, Wadi Isla is characterized by the presence of a distinct, long spring-water canal. It contains water throughout the year.

It seems that this wadi has not been throroughly investigated. There are only few specimens which have been cited by ABDALLAH et al. (1984) and EL-NAGGAR (1989) from this wadi. Among those collectors who visited Wadi Isla, are: KHATTAB (1926); SHABETAI (1937); HASSIB (1940) and ABDALLAH (1962) to be mentioned.

Recently, in September 1990, the author has got the opportunity to visit Wadi Isla, as a member of the research team of a project for Development of St. Catherine Desert Training Centre. The identification of the collected material during this trip lead to the discovery of a new *Veronica* species which is presented in this work.

DANIN et al. (1985) recorded three *Veronica* species from Sinai Peninsula. These are *V. anagallis-aquatica* L., *V. campylopoda* Boiss. and *V. rubrifolia* Boiss. subsp. *respectatissima* M.A. Fischer. In addition a fourth species *V. kaiseri* Täckh. has been described from Sheikh Umm Hussun Shideg in southern Sinai. It represents an endemic species restricted to the granite massif of the southern Sinai. Similar finding have been reported by EL-HUSSEINI A ZAREH (1989).

Veronica anagallis-aquatica L. grows near fresh water springs. *V. campylopoda* Boiss. can be found on stony slopes and in gardens. The latter species has been recently, in April 1991, collected by the author from an irrigated garden in Wadi El-Arbain. *V. rubrifolia* Boiss. subsp. *respectatissima* M.A. Fischer grows on stony slopes, also in Southern Sinai. It was seen and

collected by E. GAMAL-ELDIN and S. HENEIDIK from the E slope of Gabel Catherine. These three species are quite distinct from the new species.

The author studied the type specimen of *Veronica kaiseri* Täckh. present in CAI Herbarium, which was formerly named as *V. velenovsky* L. Uechtr. This specimen has been collected by A. KAISER in the year 1926.

In an effort to identify our material from wadi Isla with the key given by CHRTEK and OSBORNOVA-KOSINOVA (1981), we came to *V. anagalloides* subsp. *taeckholmiorum*. This subspecies is a common weed in fields in N. Cairo, Benha, Nile bank, Cairo-El-Merg, in the Nile Delta and is also distinct from the new species.

Veronica anagalloides is distinguished by the oblong calyx lobes, long lanceolate leaves and the whitish and violet veined corolla. However *Veronica anagalloides* subsp. *taeckholmiorum* is characterized by the white veined petals (not violet veined).

Veronica islensis Gamal-Eldin, sp. nov. (sect. *Beccabunga* (Hill) Dumort.)

Plantae 5-7 cm altae, rectae, glabrae. Folia inferiora breviter petiolata; folia media sessilia, 9 mm longa, 4 mm lata, ovalia, margine integra, apice acuta. Inflorescentiae oppositae, 2.5-3.5 cm longae, laxae, erectae. Flores minuti; corolla dilute violacea. Calyx 2.5-2.8 mm longus, lobis ellipticis, acutis. Fructus 3 mm longus, 2 mm latus, ellipticus, calyce paulo longior; pedicelli 4-5 mm longi, breviter sparse glandulosi; bracteae usque 1.2 mm longae, pedicellis saepe breviores, in parte superiore arcuatae.

Typus: Egpyt, Sinai Peninsula: Wadi Isla; in fresh water canal, 1.10.1990, *Gamal-Eldin* (Herb. Suez Canal University).

Annual, 5-7 cm high, glabrous, not branched from the base; stem erect. Lower leaves attenuate into a short petiole, median and upper leaves ca. 9 mm long and 4 mm broad, opposite, sessile, entire. Racemes axillary, opposite, 2.5-3.5 cm long, loosely few-flowered. Bracts small, 1,2 mm long, lanceolate, shorter than pedicel. Fruit pedicels 4-5 mm long, clearly curved upwards at tip, sparsely glandular-pubescent. Flowers small; calyx-lobes elliptic, 2.5-2.8 mm long, acute; corolla pale violet, slightly exceeding the calyx. Capsule 3 mm long, 2 mm broad, ovoid, pointed, shortly longer than calyx, not glandular. Seeds ca. 10 in each locule, minute, ovate. Fl. August-September.

This delicate, beautiful little annual is confined to fresh water canals in Wadi Isla. The ovate, sessile median and upper leaves, the pale violet flowers with incurved pedicels at the tip, capsule longer than calyx-lobes and the few flowered and loose racemes distinguish it from the related species, especially from *V. anagalloides* var. *taeckholmiorum* and *V. kaiseri*, both also recorded from Sinai Peninsula.

	V. islensis	*V. kaiseri*
Median leaves	9 mm long, 4 mm wide ovate, acute	20-30 mm long, 20-25 mm wide ± orbicular, short pointed
Upper leaves	sessile	short petiolated
Raceme	opposite	alternate
Calyx-lobes	shorter than capsule	as long as or longer than capsule
Corolla	pale violet	bright blue
Fruit-pedicels	curved at tip	not curved

Acknowledgments

The author wishes to thank the FRCU of the Supreme Council of Universities for funding this work in a frame of a Project for development of St. Catherine Desert Training Centre. Thanks are also due to the members of CAI-Herbarium especially Mrs. Dr. HASNAA HOSNY. I am grateful to Prof. Dr. D. PODLECH (Institut für Systematische Botanik der Universität München) for reading the Latin diagnosis.

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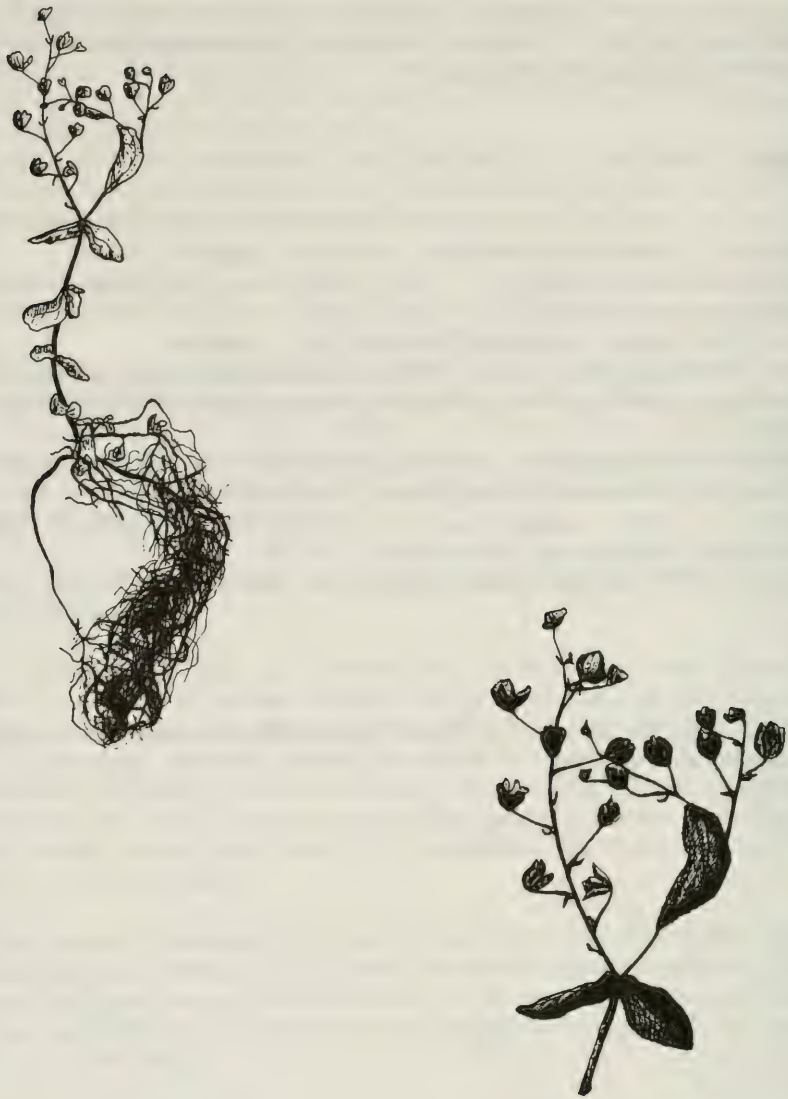

Fig. 1. *Veronica islensis*, habit and inflorescence

Systematic revision of Leguminosae in Egypt
1. Tephrosia Pers.

by

H.A. HOSNI & Z.A.R. EL-KAREMY

Abstract:
HOSNI, H.A. & EL-KAREMY, Z.A.R.: Systematic revision of Leguminosae in Egypt. 1. Tephrosia Pers. - Sendtnera 1: 245-257. 1993. ISSN 0944-0178.

A revision of the genus *Tephrosia* in Egypt is presented. Basic characters of the groups are given as well as an identification key and an enumeration of the studies specimens.

Introduction

The genus *Tephrosia* Pers. comprises about 300 species occurring throughout the tropics and in many warm temperate regions of the world, especially Africa.

According to TÄCKHOLM (1956: 300-301), seven species were known to occur in Egypt viz.: *T. apollinea, T. purpurea, T. ehrenbergiana, T. uniflora, T. quartiniana, T. arabica* and *T. nubica.* BOULOS (1966: 205) described *T. kassasii* which is characterized by its l-foliolate leaves and is believed to be endemic to the Nubian Desert of Egypt. TÄCKHOLM (1974: 257-258) followed GILLETT (1958: 123) and treated both *T. nubica* and *T. arabica* as two subspecies of *T. nubica.* On the other hand, she (1974, op. cit.) regarded the characters of leaf and flower grouping as the main features for the distinction of the Egyptian species of *Tephrosia.*

The aim of this work is to revise systematically the native taxa of *Tephrosia* with special reference to the earlier applied characters as well as other macro- and micromorphological characters, which are hoped to be more reliable for the distinction of these taxa.

This work is based on ample collections kept in the Herbaria: BM, CAI, CAIM and K as well as intensive field studies.

The upper and lower surface of the leaf as well as the seed coat have been studied by means of light microscope and a JEOL JSM scanning electron microscope, which is operated at accelerated voltage of 15 KV at the Scanning Electron Microscope centre of Assiut University.

Characters of systematic value

Leaf Characters

Leaves are generally imparipinnate, except in *Tephrosia kassasii* which is l-foliate. Leaflet shape varies from obovate-cordate in *T. uniflora* and *T. quartiniana* to oblong-lanceolate in the other taxa.

The indumentum is apparently denser on lower surfaces than the upper ones. In *T. uniflora* the leaflets are glabrous on the upper surface. It ranges from hirtellous in *T. purpurea* and *T. kassasii* to hispid in *T. uniflora, T. desertorum* and *T. purpurea* subsp. *dunensis* or tomentose in *T. nubica, T. quartiniana* and *T. villosa.* SEM examination of the indumentum showed that all the taxa possess unicellular, granulate hairs with slightly enlarged bases. In *T. purpurea* (subsp. *purpurea* & subsp. *dunensis*), *T. quartiniana, T. desertorum* and *T. nubica* the hairs are short, spreading with bulbous, slightly raised bases (Pl. I, Fig. A-D & Pl. II, Fig. A). In *T. purpurea* subsp. *apollina, T. kassasii, T. uniflora* and *T. villosa* the hairs are long, appressed with sunken non-bulbous base (Pl. II, Fig. B-D).

Pod and Seed Characters

With the exception of *Tephrosia nubia*, the other species have linear, compressed, several seeded (5-10) pods, with tomentose (*T. villosa*) or strigose-hirtellous hairs. In *T. nubica*, pods are ovoid, tomentose and one-seeded.

Most of seeds are reniform-subcylindrical, however they are subglobose in *T. quartiniana.* The seeds are small (2-2,2 x 1,5-2 mm) in *T. nubica.*

The seed coat in all species of *Tephrosia* is glossy, smooth, usually brown or grey mottled with dark spots. In *T. nubica, T. uniflora* and *T. villosa* the seeds are dark-brown, wrinkled. The hilum is ± central, circular-elliptical surrounded by a thick hilar rim of epidermal cells which differ from those of the surrounding testa. The epidermal cell pattern of the hilar rim varies from rugose in *T. villosa* to colliculate in *T. uniflora*, finely rugose in *T. nubica* and *T. quartiniana* or finely scalariform colliculate in the rest of species (Pl. III, Fig. A-D).

SEM examination of seed testa showed that the epidermal cell pattern varies from colliculate in *T. uniflora* (Pl. IV, Fig. A) to reticulate in *T. quartiniana* and *T. villosa* (Pl. IV. Fig. B, C) or reticulate-foveate in *T. purpurea* subsp. *purpurea* (Pl. V, Fig. A) to reticulate-papillate in *T. kassasii, T. purpurea* subsp. *apollinea* (Pl. V. Fig. B), subsp. *dunensis* and *T. nubica* (Pl. IV, Fig. D). The anticlinal cell wall boundaries are either indicated by channels in *T. uniflora*, or raised in the other examined test, The boundaries are either straight in *T. purpurea, T. kassasii, T. desertorum* (Pl. V, Fig. C) and *T. uniflora* or folded in *T. nubica, T. villosa* and *T. quartiniana.*

Key for the investigated taxa

1 Pod ovate, 1-seeded; seeds 5-5.5 x 3.5 mm — *T. nubica*
- Pod linear, (3) 5-10-seeded; seeds 2-4.5 x 1.5-2.5 mm — 2
2 Flowers clustered (2-3 flowers each) in leaf axils; leaf rachis short 1-2.5 cm long — 3
- Flowers in racemes, terminal and axillary; leaf rachis long (3)4-6(-9) cm long — 4
3 Leaflets 5-7; main lateral veins 4; leaflets tomentose on both surfaces; style glabrous. Seeds brown mottled with dark spots, subgloboid; epidermal cell pattern of seed coat reticulate — *T. quartiniana*
- Leaflets 3(-5); main lateral veins 7. upper surface of leaflets glabrous, the lower surface tomentose; style penicillate. Seeds brown, subcylindrical; epidermal cell pattern of seed coat colliculate — *T. uniflora*
4 Leaf 1-foliate — *T. kassassii*
- Leaf 3-11 (-13)-foliate, imparipinnate — 5
5 Pod 3-4 x 0.4-0.5 cm, strongly curved, densely tomentose; sepals filiform, more than half of the standard length, hispid; style penicillate. Epidermal cell pattern of seed coat reticulate — *T. villosa*
- Pod 3.5-5 (-6) x 0.2-0.4 cm, slightly curved, subglabrous-strigose; sepals triangular, less than half of the standard length, pubescent; style glabrous. Epidermal cell pattern

otherwise 6
Leaflets small (0.5-1 x 0.2-0.3 cm); pods short (2.5-4 x 0.2-0.3 cm); seed small (2-2.5 x 1.5 mm) *T. desertorum*
- Leaflets larger ((1)2-5 x (0.2) 0.6-1.2 cm)); pods longer (3-6 x 0.3-0.5); seeds larger (3.5-4 x 1.5-2.5 mm) *T. purpurea*

Systematic Treatment

1. Tephrosia purpurea (L.) Pers., Syn. Pl. 2: 329. 1807 ≡ *Cracca purpurea* L., Sp. pl.: 752 1753. **Type:** Ceylon, *Hermann* (BM, Holotype).

A polymorphic species in the number and size of leaflets, indumentum; as well as the size of pod and the number of seeds in each pod. Several subspecies are recognized (Brummitt, 1968: 241) of which two were known earlier from Egypt; in addition subsp. *dunensis* is a new record.

Key to subspecies:

1 Young stems, inflorescence, leaves densely pubescent (Pl. I, Fig. A) subsp. *dunensis*
- Young stems, inflorescence subglabrous-pubescent (Plate 1, e,f) 2
2 Pod 3-4 cm long, 5-6(-7) seeded, curved downwards; leaflets with 7 lateral veins, indumentum with short spreading slightly raised hairs with bulbous base; epidermal cell pattern of testa reticulate-foveolate (Pl. I, Fig. B) subsp. *purpurea*
- Pod 3.5-5 (-5.5) cm long, (3)7-9 seeded, curved upwards; leaflets with 9 lateral veins, indumentum with long appressed sunken hairs with non bulbous base; epidermal cell pattern of testa reticulate-papillate (Pl. II, Fig. B) subsp. *apollinea*

1.1 Tephrosia purpurea subsp. **purpurea**
= *Tephrosia purpurea* (L.) Pers. var. *gracilis* Täckh. & Boulos in Publ. Cairo Univ. Herb. 5: 75 (1972). **Holotype:** Gebel Um Gurdi, Gebel Elba, 11.2.1962, *V. Täckholm et al. 889* (CAI!).

Specimens seen from Egypt are with smaller number of leaflets ranging from (3)5-11(-13). Common in moist habitats and wadi beds of Gebel Elba district; very rare in Southern Sinai.

Distribution:
Known from Pakistan throughout India, Sri Lanka, China, Indonesia. Recently introduced in Africa; recorded from Kenya, Ghana, Cote d'Ivoire and Zimbabwe.

Representative specimens:

Wadi Nasib, 9.5.1982, *Bot. Dept. Excursion* s.n. (CAI); Nuweiba-Dahab road, 8.8.1988, *H. Hosni s.n.* (CAI); Wadi Aideib, Gebel Elba, 20.1.1962, *V. Täckholm et al. s.n.* (CAI); Gebel Mekerba, 23.1.1962, *V. Täckholm et al. 377* (CAI); Wadi Haikwal, 23.10.1956, *Boulos s.n.* (CAI); Wadi Mirikwan, 5.3.1963, *Abdallah 1330* (CAIM); Bir Kansisrob, 3.2.1962, *V. Täckholm et al. 1256* (CAI); Wadi Haiteem, 27.1.1962, *V. Täckholm et al. 761* (CAI).

1.2 Tephrosia purpurea subsp. **dunensis** Brummit in Bol. Soc. Brot. sér. 2, 41: 251 (1968).
Holotype: Tanganyka, 16 miles N. of Dar es Salam, sand dunes, 2.7.1960, *Leach & Brunton 10164* (K!).

Very rare in wadi beds and oases of Southern Sinai.

Distribution:
Eastern coasts of Africa, Somali Republic, Mozambique, Lake Malawi, Kenya, Tanzanya and the islands of the Indian Ocean.

Representative specimens:

Southern Sinai, Sharm El Sheikh, 18.8.1982, *Bot. Dept. Excursion* s.n. (CAI); Um Maru, 24.10.1926, *Kaiser 929* (CAIM); Wadi Feiran, Mzeriq, 22.11.1926, *Kaiser 919* (CAIM); Wadi Nasb, 5.4.1982, *Bot. Dept. Excursion* s.n. (CAI); Wadi Isla, April 1940, *Hassib* s.n. (CAI); Kharga Oasis, 4.11.1966, *Hadidi* s.n. (CAI); sandy waste near Qalamum, Dakhla, 14.4.1928, *Simpson 6083* (CAIM).

1.3 Tephrosia purpurea subsp. **apollinea** (Del.) H. Hosni & El-Karemy comb. et stat. nova
Basionym: *Galega apollinea* Del., Descr. Egypt., Hist. nat.: 70 no. 688 et 288-289 pl. 53, fig. 5 (1813) ≡ *Tephrosia apollinea* (Del.) Link, Enum. Hort. Berol. Alt. 2: 252 (1822).
Type: Egypt, Edfu, *Delile* s.n. (P).

Common in dry and moist habitats of the Nile Nubian territory, Nubian and Arabian deserts, the coastal plains along the Red Sea in Southern Sinai, Gebel Elba massive; rare in the oases of Western Desert.

Distribution:
Known from the Sudan, Ethiopia, Somalia Republic, Djibuti, eastward to Arabia, Iran and Pakistan.

Representative specimens:

Abu Simbel, 4.2.1963, *V. Täckholm et al. 188* (CAI); Aniba, 14.-18.11.1963, *V.Täckholm et. al.* s.n. (CAI); Aswan, 7.1.1909, *Schweinfurth* s.n. (CAI); Wadi Seyal, N. Galala, 15.2.1956, *Imam* s.n. (CAI); Wadi Aber, near Suez, 15.2.1956, *Hadidi* s.n. (CAI); El Allaqi, 17.3.1963, *Abdallah 1701* (CAIM); Kharga Oasis, 12.3.1928, *Simpson 2134* (CAIM); Dakhla Oasis, 14.9.1928, *Simpson 6088* (CAIM); Wadi Madsus, 17 km from Sharm El Sheikh, 17.8.1982, *Bot. Dept. Excursion* s.n. (CAI); Ain Sokhna, Red Sea coast, 8.2.1952, *Hadidi* s.n. (CAI); Wadi Aideib, 26.2.1938, *Shabetai 5109* (CAIM); Syene, Silsilis, s.d., *Sieber* s.n. (K); Aegypto-inferiore, 1836, *Kotschy 941* (K).

Note:
Galega apollinea Del. is a North African taxon which was treated by Link (1822) as *Tephrosia apollinea*. It is closely related to *T. purpurea* which was described from Sri Lanka. Both species agree in most of their characters and the distinction between typical forms is rather difficult; which justifies the treatment of both taxa as conspecific.

The plants which grow in the Eastern Desert of Egypt may produce smaller pods (2,5-4 x 0,3-0,4 cm) and even smaller leaves and leaflets (1,5-2,5 x 0,5-0,8 cm), appearing therefore different (Suez, in desert, 4.1875, *Hildebrandt* s.n. (BM); Wadi Harunis, S. Galala, 10.2.1956, *Imam & Abdel Fadeel* s.n. (CAI). Plants from oases (Kharga Oasis, Hibis, 7.2.1952,

V.Täckholm & Kassas s.n. (CAI); Dakhla Oasis, 16.8.1967, *Hadidi* s.n. (CAI) differ from the typical form in having rather densely pubescent spreading hairs.

2. Tephrosia desertorum Scheele in Linnaea XVII: 383 (1843). **Holotype:** In planitie deserti prope Dscheddam, 20.12.1835, *Schimper 770* (BM!)

This species is best distinguished from *T. purpurea* by its smaller leaflets (0.5-1 x 0.2-0.3 cm); its pods which are generally narrow (2.5-4 x 0.2-0.3 cm); by its smaller seeds (2-2.5 x 1.5 mm).

Very rare in wadi beds of Arabian Desert of Egypt.

Distribution:
Known from Arabian Peninsula.

Representative specimens:

Wadi Um Lassaf, S. Qosseir, 2.2.1933, *Drar* s.n. (CAIM); Wadi Ararat, 11.2.1932, *Drar* s.n. (CAIM).

3. Tephrosia kassasii Boulos in, Feddes Repert. 73: 205 (1966). **Holotype:** Egypt, Aniba, 18.1. 1963, *V. Täckholm et al.* (CAI!).

Rather distinct by its 1-foliate leaves, although some intermediate forms exist. Only known from the type locality.

Distribution:
Believed to be endemic to the Nubian Desert of Egypt.

4. Tephrosia villosa (L.) Pers., Syn. Pl. 2: 329 (1807) ≡ *Cracca villosa* L., Sp. Pl.: 752 (1753).

4.1. Tephrosia villosa subsp. **ehrenbergiana** (Schweinf.) Brummit in Bol. Soc. Brot. ser. 2, 41: 225 (1968) ≡ *Tephrosia ehrenbergiana* Schweinf., Beitr. Fl. Aethiop.: 18 (1867). **Type:** Eritrea, *Ehrenberg s.n.* (B, Lectotype).

Very rare in Egypt, recorded from Kharga Oasis.

Distribution:
Known from Angola, Kenya, Eritrea, Somalia, Sudan, Tanzania, Zimbawi, Uganda, Mozambique and Namibia; also from the islands of the Indian Ocean.

Representative specimens:

Ein Serag, Kharga, 23.1.1924, *Simpson 2373* (CAIM, K).

5. Tephrosia uniflora Pers., Syn. Pl. 2: 329 (1807).

5.1. Tephrosia uniflora subsp. **petrosa** (Blatt & Hall.) Gillet & Ali in Bull. 13 (1): 114 (1958) ≡ *Tephrosia petrosa* Blatt & Hall. Journ. Bombay N.H.S. 26: 239 (1918). **Type:** India, Rajasthan, Taisalmer, *Blatter 6970* (K, Lectotype, Photo !).

Differs from the type subspecies by its 3-5 leaflets; pods which are about 4 cm long with 8-9 seeds in each.

Confined in Egypt to moist habitats of Gebel Elba massive. Known from the Sudan, Ethiopia and Somalia, eastwards in Arabia, Pakistan and India.

Representative specimens:

Gebel Karam Elba, 7.2.1962, *V. Täckholm et al. 1722* (CAI); Wadi Yahameib, 22.1.1962, *V. Täckholm et al. 259* (CAI); Gebel Alafoot, 7.2.1962, *V. Täckholm et al. 1626* (CAI); Wadi Rabdeit, 21.1.1933, *Shabetai 2655* (CAIM); N. Wadi Laham, 29.10.1956, *Khattab 107* (CAIM).

6. Tephrosia quartiniana Cuf. ex Greuter & Burdet in Willdenowia 16 (2): 446 (1987). **Type:** Ethiopia, Djeladjekanne ad flumen Taccazze, *Quartin-Dillon s.n.* (P, Holotype).
= *Tephrosia vicioides* A. Rich., Tent. Fl. Abyss. 1: 188 (1847), nom. illegit. non Schlecht. (1838).

Confined in Egypt to moist habitats of Gebel Elba massive.

Distribution:
Known from Ethiopia, Eritrea, Sudan, Mali and Mauritania, eastwards to Southern Arabia.

Representative specimens:

Gebel Alafoot, 7.2.1962, *V. Täckholm et al. 1659* (CAI); Wadi Ararat, 11.2.1933, *Drar s.n.* (CAIM); Wadi Mera Kwan near Halaib, 1933, *Drar s.n.* (CAIM); Wadi Rabdeit, 21.1.1933, *Shabetai 2656* (CAIM).

7. Tephrosia nubica (Boiss.) Baker in Fl. Trop. Africa 2: 125 (1871).

7.1. Tephrosia nubica subsp. **nubica**
Basionym: *Pogonostigma nubicum* Boiss., Diagn. Pl. Or. ser. 1,2: 39 (1843)
= *Pogonostigma abyssinicum* Jaub. & Spach, Ill. P. Orient. 5: 88. 1856 ≡ *Tephrosia nubica* var. *abyssinica* (Jaub. & Spach) Schweinf. in Bull. Herb. Boiss. 4, app. 2: 247 (1896).

Leaflets (3) 5-9, oblanceolate, (2) 3-4 x 0,2-0,6 cm, villous to densely tomentose; lateral veins 4-5, usually red; pod wooly, ovate, 1,1 x 0,7 cm with a 2 mm stipe, sed solitary, brown, 5-5,5 x 3,5 mm.

Confined in Egypt to moist habitats and wadi beds of the Arabian Desert and Gebel Elba massive.

Distribution:

Known from Djibuti, Ethiopia, Kenya, Mauritania, Niger, Sudan and Chad.

Representative specimens:

Gebel Elba, 23.-27.1.1929, *G. Täckholm* s.n. (CAI); Gebel Elba, 14.1.-6.2.1933, *Fahmy & Hassib* s.n. (CAI, K); Wadi Khasher, 1924-25, *Murray 3349* (K); Gebel Karam Elba, 1925-26, *Murray 3882* (K); Wadi Kansisrob, 28.1.1933, *Shabetai 2654* (CAIM); Wadi Haikwal, 27.1.1933, *Drar 222* (CAIM); Wadi Ehmeit, 20.1.1933, *Shabetai 2661* (CAIM); Upstream of Wadi Seramatai, 29.1.1962, *V. Täckholm et al. 1998* (CAI).

Note:

TÄCKHOLM (1974: 257) reported the occurrence of subsp. *nubica* and *arabica* (Boiss.)Gillet, which vary in regards of the shape, number of leaflets and the pod size. The examined material from the Arabian Desert and Gebel Elba district of Egypt apparently belongs to subsp. *nubica*. This agree with the fact that subsp. *arabica* is a S.W. Asiatic taxon which is not known from Africa.

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The autors are indebted to the keepers of the Herbaria BM, CAI, CAIM and K for facilities provided and material sent on loan.

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Explanations to plates I-V

Plate I
SEM micrographs of leaf epidermis
Fig. A - *T. purpurea* subsp. *dunensis*, x 500; B - *T. purpurea* subsp. *purpurea*, x 650; C - *T. nubica*, x 650; D - *T. desertorum*, x 400.

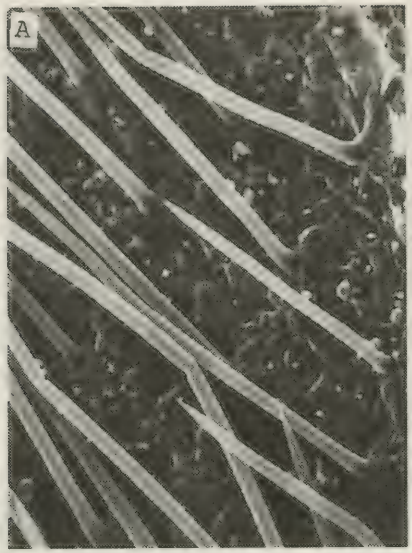
Plate II
SEM micrographs of leaf epidermis
Fig. A - *T. quartiniana*, x 500; B - *T. purpurea* subsp. *apollinea*, x 650; C - *T. kassasii*, x 650; D - *T. uniflora*, x 180.

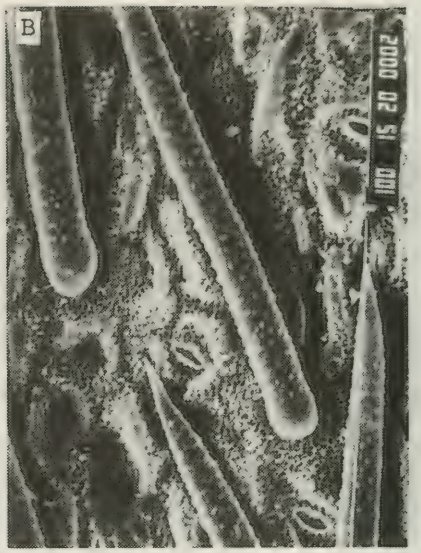
Plate III
SEM micrographs of hilar rim and hilar cavity of seeds
Fig. A - *T. purpurea* subsp. *apollinea*, x 90; B - *T. villosa* subsp. *ehrenbergiana*, x 180; C - *T. uniflora* subsp. *petrosa*, x 300; D - *T. purpurea* subsp. *purpurea*, x 90; E - *T. nubica*, x 190; F - *T. quartiniana*, x 150.

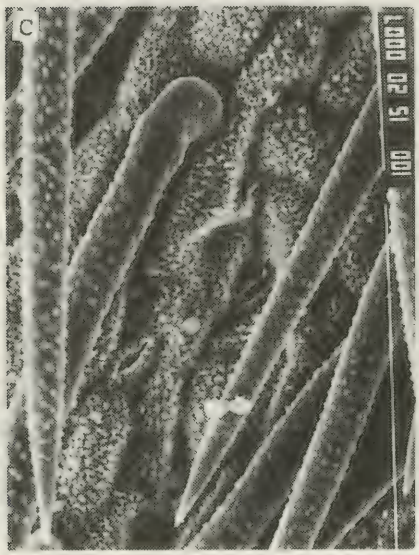
Plate IV
SEM micrographs of seed coat
Fig. A - *T. uniflora* subsp. *petrosa*, x 1800; B - *T. quartiniana*, x 500; C - *T. villosa* subsp. *ehrenbergiana*, x 1800; D - *T. nubica*, x 1500.

Plate V
SEM micrographs of seed coat
Fig. A - *T. purpurea* subsp. *purpurea*, x 650; B - *T. purpurea* subsp. *apollinea*, x 1800; C - *T. desertorum*, x 1200.

Plate I







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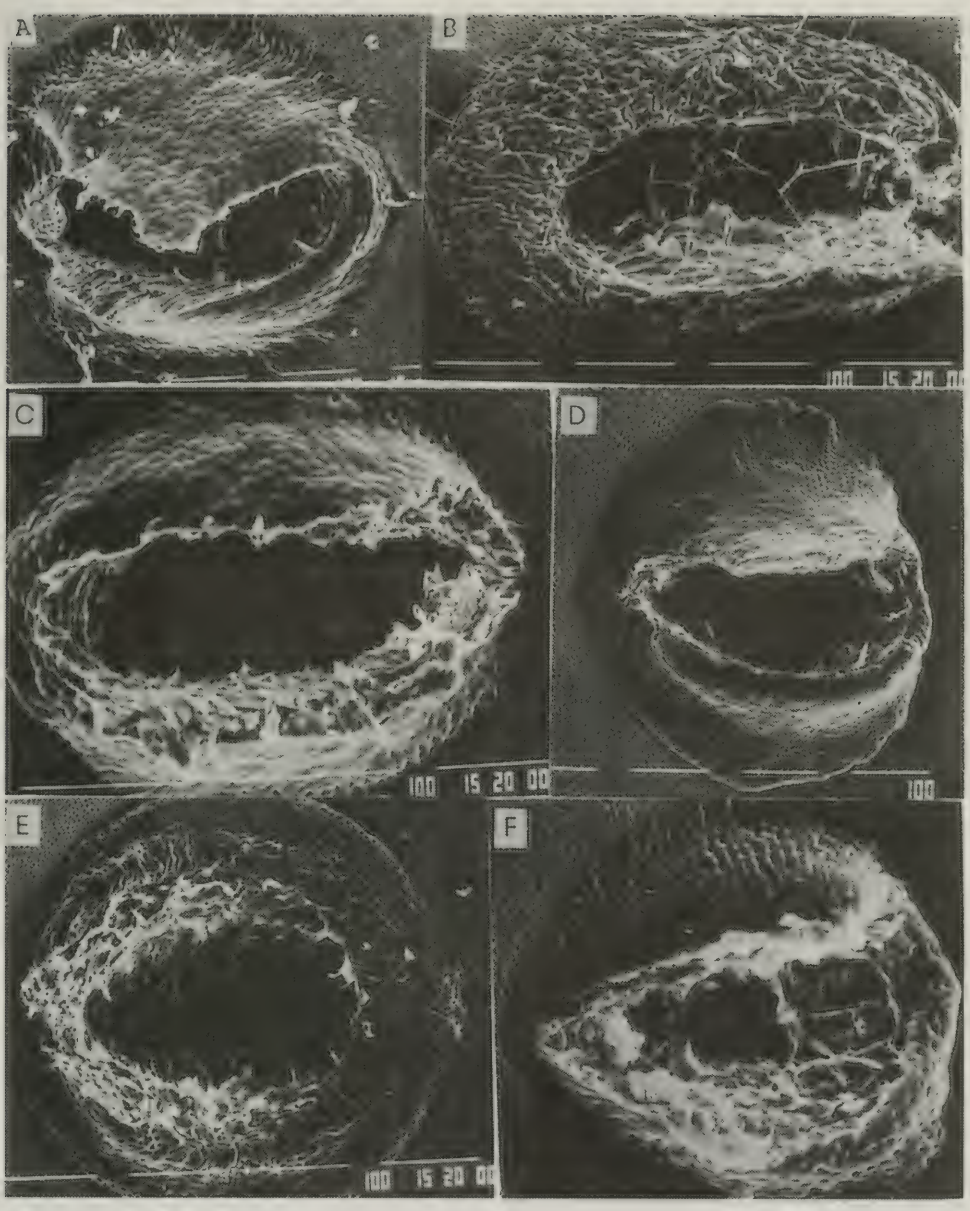


Plate III

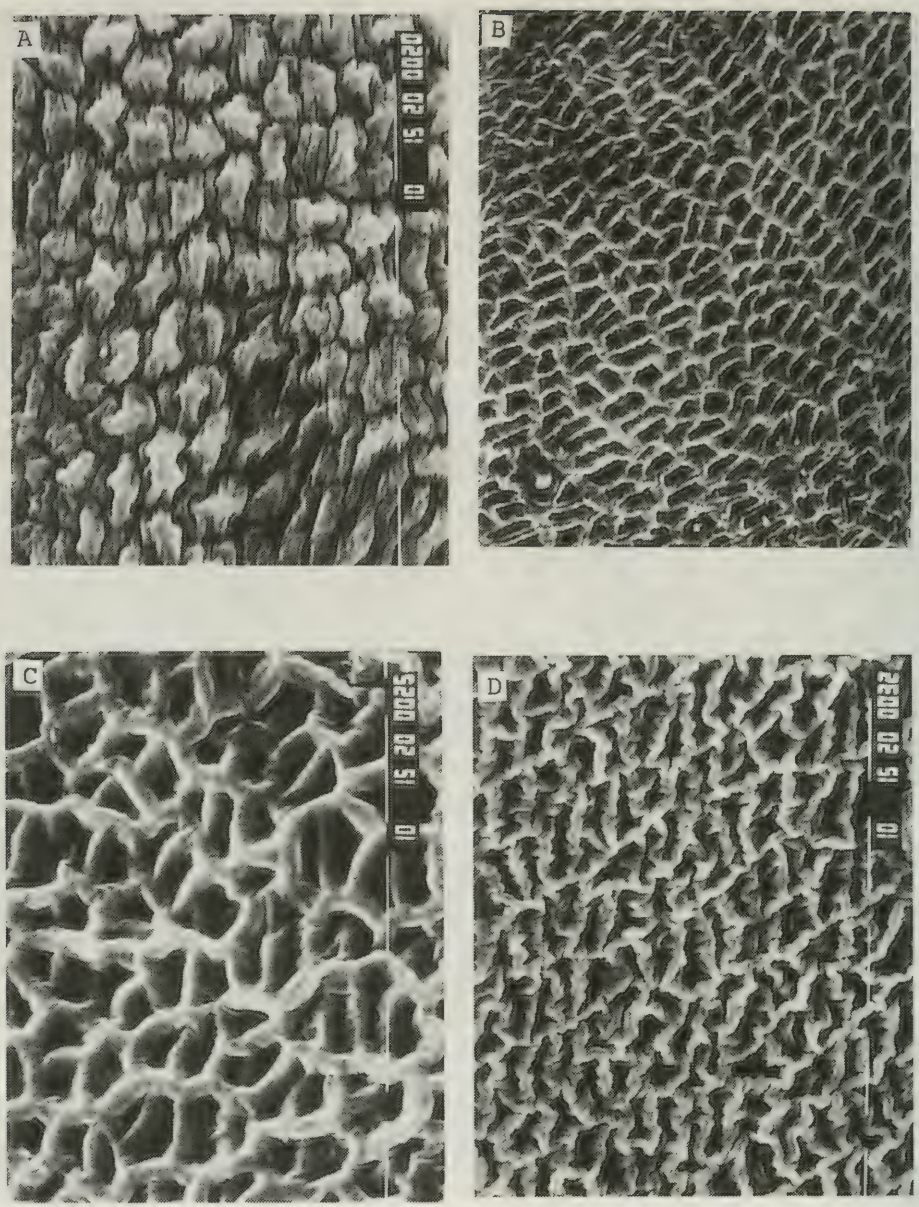
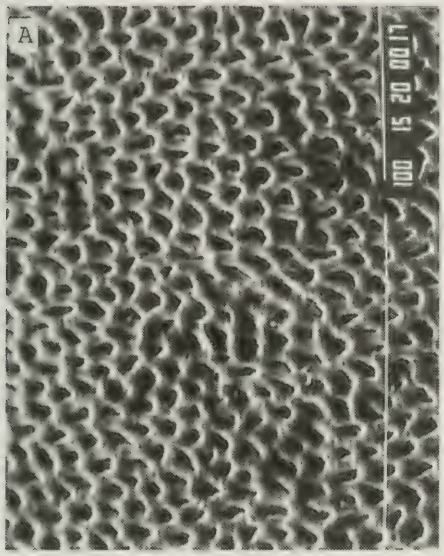
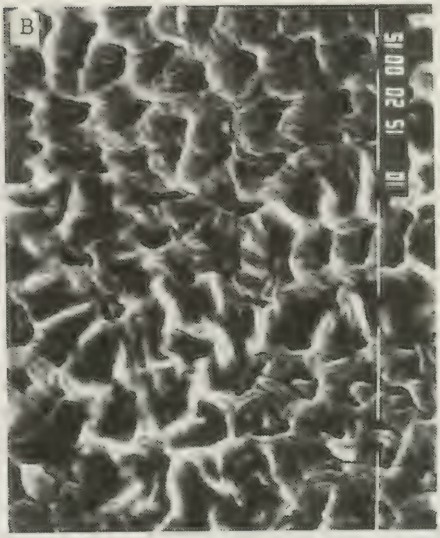


Plate IV





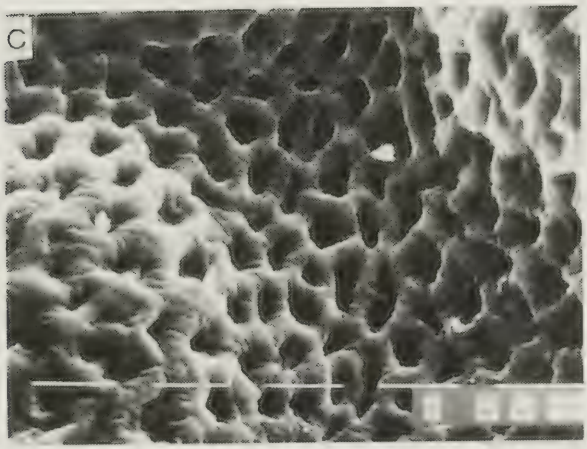


Plate V

Neue Arten von Astragalus L. sect. Campylanthus Bunge und sect. Megalocystis Bunge im Iran

von

S. TIETZ und SH. ZARRE M.

Abstract:
TIETZ, S. & ZARRE, M. SH.: Neue Arten von Astragalus L. sect. Campylanthus Bunge und sect. Megalocystis Bunge im Iran. Sendtnera 1: 259-265. 1993. ISSN 0944-0178.

The present paper comprises the descriptions of three new species of *Astragalus: A. brevirhachis*(sect. *Campylanthus*) closely related to *A. susianus* Boiss., *A. pseudotortuosus* (sect. *Megalocystis*)closely related to *A. tortuosus* DC. and *A. ghashghaicus* (sect. *Megalocystis*), a species with largeflowers comparable with *A. megalocystis* Bunge and *A. rubrolineatus* Sirj. & Rech. f., but different inthe shape of standard. *A. brevirhachis* is the first species of the section *Campylanthus* which is distributed in the southern part of Iran (Prov. Hormozgan).

Im Rahmen der Untersuchungen für eine angestrebte Revision von sect. *Megalocystis* ergaben sich für den Iran zwei neue Arten, die hier beschrieben werden. Durch die verstärkte Sammeltätigkeit im Iran in den letzten Jahren wurde außerdem neues Pflanzenmaterial zur schon revidierten sect. *Campylanthus* (TIETZ 1988) eingebracht. Auch hier fand sich eine neue Art, durch die sich für die Sect. *Campylanthus* eine Erweiterung des bisher bekannten Areals nach Süden hin ergibt.

Astragalus brevirhachis Tietz & Zarre M., spec. nov. (sect. *Campylanthus*). **Holotypus:** Iran, Bandar - Abbas: Bokhon, Tashgerd and Boneh Mountains, 1800-2700 m, 2.5.1985, *Mozaffarian 52502* (TARI!; Iso: Herb. PODLECH!)

Valde affinis *A. susianus* Boiss., sed differt rachidibus brevioribus paucijugis, stipulis bracteisque sparse pilosis vel glabris, calycis dentibus brevioribus pilis brevibus obtectis et carinae laminis acutis, non longe acuminatis.

Fruticulus spinosus, c. 20 cm altus, laxe ramosus, ramis hornotinis ad apicem ramorum dense congestis, pilis basifixis albis 0,1-0,7 mm, in calyce ad 1,5 (-2) mm longis vestitus. Stipulae hyalinae, late triangulares, 3-5 mm longae, petiolo adnatae, basi inter se vix connatae, sparse pilosae vel glabrae, ciliatae. Folia 1,5-2,5 cm longa, (3-) 5-8 juga; rachides dense erecto-patentes vel recurvatae, dense patule pilosae; foliola viridiuscula, 1-4 mm longa et 0,5-2 mm lata, oblonga vel elliptica, apice acuta, interdum obsolete mucronulata, utrinque dense patule pilosa, complicata. Racemi subsessiles, dense globosi, fructiferi 1,5-2 cm longi et lati. Bracteae hyalinae, 2-5 mm longae, naviculares, late ovatae vel orbiculatae, acuminatae, glabrae vel sparse pilosae, ciliatae, superiores minutae, ovatae. Bracteolae nullae. Pedicelli subnulli, ad 1 mm longi. Calyces floriferi campanulati 7-10 mm longi et 2-3 mm lati, fructiferti vix

increscentes, 3-4 mm lati, rubrolineati, primo sericei, demum patule pilosi, dentibus subulatis 3,5-5 mm longis. Petala lactea, purpurei-suffusa. Vexillum c. 10 mm longum, lamina valde recurvata, c. 6 mm longa et lata, orbiculata, vix emarginata, basi angulata. Alae c. 8,5-10 mm longae, lamina 5-6 mm longa et 2-3 mm lata, obovata vel oblonga, ungue valde curvato. Carina c. 8,5-10 mm longa, lamina 4,5-5 mm longa et 3 mm lata, triangulari, acuta, ungue valde curvato. Legumina (immatura) vix stipitata, unilocularia.

Pflanzen ca. 20 cm hoch (Pflanze unvollständig), locker verzweigt; junge Äste an der Spitze der Haupttriebe dicht gedrängt. Haare weiß, dünn und spitz, 0,1-0,7 mm, an den Kelchen bis 1,5 (-2) mm lang, Äste bis 10 cm lang, mit einem Zuwachs von 0,5-1 cm, im ersten Jahr, 2-3 mm dick, von den Nebenblättern dicht umhüllt, rasch verkahlend, mit bleibenden Dornen. Nebenblätter dünn-häutig, gelblich, 3-5 mm lang, aus breiter Basis kurz dreieckig, auf 2-3 mm mit dem Blattstiel verwachsen, den Stengel umfassend, auf der Gegenseite höchstens basal verwachsen, spärlich behaart oder nur am Rand bewimpert. Blätter 1,5-2,5 cm lang; Rhachiden dicht schräg aufrecht stehend bis zurückgebogen, dünn, starr und stechend, im ersten Jahr dicht kurz abstehend behaart; Blattstiel ca. 1/3 so lang wie die Rhachis; Enddorn bis 3 mal so lang wie die obersten Blättchen; Blättchen in (3-) 5-8 Paaren, dicht schräg aufrecht stehend, sehr kurz gestielt, grünlich, 1-4 mm lang und 0,5-2 mm breit, schmal elliptisch bis elliptisch, vorne spitz, mit höchstens winzigem Spitzchen, beiderseits dicht abstehend behaart, zusammengefaltet. Blütenstände die Blätter nicht überragend, dichtblütig, kugelig, zur Fruchtzeit ca. 1,5-2 cm lang und breit, fast sitzend, die sehr kurzen Stiele abstehend behaart. Brakteen häutig, durchscheinend, 2-5 mm lang, kahnförmig, am Rande dicht bewimpert, auf der Fläche höchstens spärlich kurzhaarig, die unteren breit eiförmig bis rundlich, zugespitzt, die oberen eiförmig, deutlich kleiner. Brakteolen fehlend. Blütenstiele höchstens bis 1 mm lang. Kelche 7-10 mm lang, zur Blütezeit glockig, 2-3 mm breit, zur Fruchtzeit schwach vergrößert, 3-4 mm breit, gelblichweiß rot längsgestreift, mit 9-10 Nerven, zur Blütezeit sehr dicht, zur Fruchtzeit etwas lockerer mit kurzen und langen erst seidig anliegenden, später abstehenden Haaren besetzt; Zähne aus schmal dreieckiger Basis pfriemlich, 3,5-5 mm lang, etwa so lang wie die Röhre. Kronblätter gelblichweiß, Platten purpurn überlaufen. Fahne ca. 10 mm lang; Platte ca. 6 mm lang und breit, kreisrund, schwach ausgerandet, mit winzigem Spitzchen, am Grunde fast rechtwinklig zurückgebogen, in den rinnigen Nagel übergehend. Flügel ca. 8,5-10 mm lang; Platte 5-6 mm lang und 2-3 mm breit, verkehrt eiförmig bis länglich, vorne gerundet bis schief; Öhrchen 0,5-1 mm lang; Nagel 5-6 mm lang. Schiffchen ca. 8,5-10 mm lang; Platten 4,5-5 mm lang und 3 mm tief, dreieckig, vorne spitz, mit breit bogiger Unterkante und gerader Oberkante, am Grunde deutlich geöhrt. Fruchtknoten sehr dicht behaart; Griffel an der Basis behaart. Früchte (unreif), sehr kurz gestielt, seitlich wohl zusammengedrückt.
Blüte- und Fruchtzeit: V. Vorkommen: 1800-2700 m.

Verbreitung:
S-Iran: Hormozgan.

Gesehene Belege:
Bisher nur vom Typus bekannt.

A. brevirhachis steht *A. susianus* Boiss. am nächsten. Beide Arten haben fast sitzende, kopfige Blütenstände und ähnliche Blättchenform. Die abstehende Behaarung der Blättchen gleicht subsp. *susianus*, die Form der Brakteen subsp. *sericeus*. Von beiden unterscheidet sich die neue Art jedoch durch kürzere Dornen mit weniger Blättchenpaaren und fast kahle Nebenblätter und Brakteen. Die Blüten weisen die typischen Merkmale der sect. *Campylanthus* auf, doch sind die Kelchzähne und die Haare an den Kelchen kürzer als bei allen anderen Arten der Sektion. Das Schiffchen ist spitz, aber nicht lang zugespitzt wie bei *A. susianus*.

Astragalus ghashgaicus Tietz & Zarre M., spec. nov. (sect. *Megalocystis*). **Holotypus:** Iran, Pashma-Kuh, a Semirom 5 km occidentem versus, 2700-3000 m, 6.6.1974, *Rechinger 47424* (W!).

Species *A. megalocystis* Bunge et *A. rubrolineatus* Sirj. & Rech. f. petalis grandibus similis, sed differt imprimis vexilli lamina basi rotunda, nec angulata nec auriculata, et insuper ab *A. megalocystis* racemis paucifloris folia non superantibus et foliis sericeus, ab *A. rubrolineatus* calyce multinervo.

Fruticulus ca. 25 cm altus, dense ramosus, ramis crassis, spinis vetustis brevibus persistentibus armatis, folia annotina ad apicem tantum ferentibus, pilis basifixis albis, in pedunculis calycibusque nigris intermixtis, 0,1-1,3 mm, in calycibus ad 3 mm longis. Stipulae membranaceae, lanceolati - triangulares, 5-10 mm longae, petiolo adnatae, inter se basi vix connatae, pilosae. Folia 2-10 cm longa, 5-10 juga; rachides erecto-patentes, dense pilis maxima pro parte appressis tectae; foliola 2,5-15 mm longa et 1-5 mm lata, plana, elliptica vel anguste elliptica, apice rotundata vel acuta, distincte mucronata, utrinque dense appresse sericea. Racemi laxe 2-5 flori, 2-10 cm longi, folia non superantes, pedunculo appresse vel patule piloso. Bracteae membranaceae, caducae, 3-10 mm longae, ovatae, pilosae. Bracteolae binae, 3-6 mm longae, subulatae. Pedicelli 2-5 mm longi. Calyces floriferi tubulosi (13-) 15-20 mm longi et 5-7 mm lati, fructiferi globosi 20-30 mm longi et 15 mm lati vel latiores, albidi vel grisei, interdum rubrolineati, ca. 25 nervi, dense subapprese mox patule pilosi, dentibus subulatis vel filiformis 4-8 mm longis. Petala ochroleuca vel pallide rosea. Vexillum 18-26 mm longum, lamina recurvata 9-15 mm longa et lata, late ovata vel orbiculata, apice emarginata, basi rotundata. Alae 29-28 mm longae, lamina 7-12,5 mm longa et 3,5-5 mm lata, obovata vel elliptica, distincte auriculata. Carina 18-24 mm longa, lamina 5-8 mm longa et 3-4,5 mm lata, triangulari vel oblonga, apice brevissime rostrata. Legumina unilocularia, longe stipitata, immatura 6-10 mm longa, dorsoventraliter compressa, valvis appresse albo-pilosis, non nervatis. Semina immatura.

Pflanzen bis ca. 25 cm hoch, dicht buschig verzweigt, mit kurzen, dicken Ästen. Haare 0,1-1,3 mm, an den Kelch bis 3 mm lang, weiß, im Blütenstand auch schwarz, dünn, etwas abgeflacht, überwiegend gerade, einige auch gebogen bis gekräuselt. Äste bis 10 cm lang, mit einem Zuwachs von 0,5-2,5 cm im ersten Jahr, 5-7 mm dick, von den sich deckenden Nebenblättern sehr dicht umhüllt; alte Äste langsam verkahlend, mit behaarten Nebenblattresten und bleibenden Dornen. Nebenblätter dünnhäutig, gelblichweiß, 5-10 mm lang, aus breiter Basis dreieckig bis schmal dreieckig oder lanzettlich, auf 2-3 mm mit dem Blattstiel verwachsen, darüber durch eine Naht oder einen kurzen Hautsaum verbunden, den Stengel umfassend, auf der Gegenseite höchstens basal verwachsen, dicht anliegend behaart, die oberen bisweilen nur gewimpert. Blätter 2-10 cm lang; Rhachiden sehr dicht aufrecht stehend, meist dick, deutlich verdornt, starr und stechend, mehrere Jahre bleibend, im ersten Jahr dicht bis sehr dicht mit kurzen anliegenden und meist auch längeren anliegenden bis schräg abstehenden Haaren besetzt; Blattstiel 1/4-1/3 der Rhachislänge erreichend; Enddorn bis 5 mal so lang wie die obersten Blättchen; Blättchen in 5-10 Paaren, ziemlich dicht stehend, 2,5-15 mm lang und 1-5 mm breit, flach ausgebreitet, schmal elliptisch bis elliptisch, vorne gerundet bis spitz, mit einer bis 1,5 mm langen Stachelspitze, dicht anliegend behaart, grauseidig. Blütenstände 2-10 cm lang, die Blätter nicht überragend, locker 2-5-blütig; Achsen dicht bis sehr dicht mit weißen, im oberen Teil auch schwarzen, kurzen und längeren anliegenden bis abstehenden Haaren besetzt. Brakteen hinfällig, dünnhäutig, 3-10 mm lang, eiförmig, zugespitzt, wie die Brakteolen mit weißen oder auch schwarzen Haaren besetzt. Braktolen 3-6 mm lang, schmal eiförmig bis pfriemlich. Blütenstiele 2-5 mm lang, mit weißen und schwarzen Haaren besetzt. Kelche zur Blütezeit (13-) 15-20 mm lang und 5-7 mm breit, röhrig, grünlichgelb bis zart rot, durch die Behaarung oft schwarz, zur Fruchtzeit 20-30 mm lang und

ca. 15 mm breit (auch breiter?), blasig vergrößert, eiförmig-ellipsoidisch, an den Zähnen zusammen-gezogen, gelblichweiß bis zart rot gestreift, mit ca. 25 Nerven und dazwischen kaum ausgeprägtem Netz, zur Blütezeit sehr dicht, zur Fruchtzeit etwas lockerer mit kurzen und langen weißen und schwarzen anliegenden und wirr abstehenden Haaren besetzt; Zähne aus kurz dreieckiger Basis pfriemlich bis fädlich, 4-8 mm lang, 1/4- fast 1/2 der Röhre. Kronblätter gelblichweiß, Schiffchen-spitze oder auch Fahnensaum z.T. zart purpurn. Fahne 18-26 mm lang; Platte 9-15 mm lang und 9-14 mm breit, brei eiförmig bis fast rund, vorne ausgerandet, gerundet in den Nagel übergehend. Flügel 20-28 mm lang; Platten 7-12,5 mm lang und 3,5-5 mm breit, verkehrteiförmig bis elliptisch, vorne gerundet bis schief, bisweilen ausgerandet; Öhrchen ca. 1 mm lang; Nägel 10-17 mm lang. Schiffchen 18-24 mm lang; Platten 5-8 mm lang und 3-4,5 mm tief, dreieckig bis länglich, mit breit bogiger bis fast rechtwinkliger Unterkante und konkaver Oberkante, vorne kurz geschnäbelt. Fruchtknoten sehr dicht behaart. Griffel an der Basis oder bis zu 1/2 seiner Länge behaart. Früchte wie die Fruchtknoten mit einem 1,5-4 mm langen Stiel, unreif ca. 6-10 mm lang, von oben zusammengedrückt; Klappen hart und dickt, braungelb, ohne Nerven, dicht kurzanliegend weiß-haarig; Schnabel bis 2 mm lang, dick. Samen unreif.
Blüte- und Fruchtzeit: V-VIII. Vorkommen: 2500-3900 m.

Verbreitung:
Iran: Qashqai und benachbarte Gebiete.

Gesehene Belege:
Iran. Prov. Esfahan: Semirom region, Kuhe Pashmakuh mountains, 5 km W Semirom, 2600-3000 m, 6.6.1974, *Reino Alava 13622* (TUR) -- Semirom region, foothills of the north facing slopes of Kuhe Surmandeh mountain, 2700-3600 m, 7.6.1974, *Reino Alava 13657* (TUR) -- E of Semirom, Kuh-e Aiineh Ghabri, 3000-3700 m, 9.8.1978, *Assadi & Mozaffarian 31680* (TARI) -- Semirom, Kuh-e Pashmakou, 2600-3000 m, 6.6.1974, *Iranshahr 40948* (IRAN) -- Kuh-e surmandeh, 2750-3600 m, 7.6.1974, *Iranshahr s.n.* (IRAN) -- Chahar-Mahal-e Bakhtiari: Lordegan, Kuh-e rig, from Deh - Kohne, 3200 m, 7.7.1986, *Mozaffarian 57522* (TARI) -- Pashma Kuh, a Semirom 5 km occidentem versus, 2700-3000 m, 6.6.1974, *Rechinger 47424* (W: Holotypus) -- in faucibus Darreh Abshar a Semirom orientem versus, 2450 m, 6.6.1974, *Rechinger 47460* (W) -- Kuh-e Surmandeh (Kuh-e Alijug), N Semirom, 2700-3900 m, 7.6.1974, *Rechinger 47588* (W). Prov. Fars: Abadeh, Kaftar, Kuhe Gabri, 7.6.1969, *Terme & Izadyar 14723-E* (W) -- Abadeh, Shahrmian, Kushk-e Zar, Darre Gol, 2550-3000 m, 4.6.1975, *Wendelbo & Foroughi 17847* (TARI).

Die neue Art fällt durch die großen Blüten auf. Die großen Platten der Flügel und Schiffchen erinnern an *A. megalocystis* Bunge oder an *A. rubrolineatus* Sirj. & Rech.f., doch zeichnen sich diese Arten durch eckige bis geöhrte Fahnenplatten aus, während bei *A. ghashghaicus* die Fahnenplatten gerundet in den Nagel übergehen. Der in benachbarten Gebieten häufige *A. murinus* Boiss. ähnelt der neuen Art durch die wenigblütigen, die starren Rhachiden nicht überragenden Blütenstände und die dunkle Kelchbehaarung. Die beiden Arten unterscheiden sich jedoch grundlegend durch die Form und Größe der Blüten wie auch durch die nicht seidige Blättchen-behaarung. Die auffallende Art wurde bisher vor allem im Qashqai Gebiet gesammelt und wird deshalb nach diesem Gebiet benannt.

Astragalus pseudotortuosus Tietz & Zarre M., spec. nov. (sect. Megalocystis). **Holotypus:** Iran, 43 km SW Kermanshah, 1680 m, 14.6.1959, *Pabot 1871* (= *12450-E*) (IRAN!; Iso: G!, W!).

Valde affinis *A. tortuoso* DC., sed differt racemis paucifloris folia non superantibus, calycibus brevipilosis et laminis petalorum minoribus. Ab omnibus speciebus sectionis laminis petalorum minutis distinctus.

Fruticulus, ca. 20 cm altus, prostratus, ramosus, ramis tenuibus dense intricatis, spinis vetustis persistentibus armatis, pilis basifixis albis vel lutescentibus 0,1-1,5 mm longis vestitus. Stipulae membranaceae 2-5 mm longae, petiolo adnatae, alte connati-vaginantes, pilosae. Folia 1-7 cm longa, 6-15 juga; rachides patentes vel recurvatae, dense patule pilosae vel tomentosae; foliola 1-5 mm longa et 1-3,5 mm lata, crassiuscula, complicata, elliptica vel orbiculata, apice rotundata, interdum obsolete mucronulata, utrinque lanati-tomentosa. Racemi laxe 2-5 flori, 2-5 cm longi, folia non superantes, dense patule pilosi. Bracteae membranaceae caducae, 2-3 mm longae, ovatae, acuminatae. Bracteolae binae, minutae, caducae. Pedicelli 1-4 mm longi. Calyces floriferi tubulosi, 10-14 mm longi et 3-5 mm lati, fructiferi elliptico-globosi, 15-25 mm longi et 9-14 mm lati, ca. 25 nervis, brunneoli, dense patule pilosi, dentibus subulatis 2,5-4 mm longis. Petala ochroleuca. Vexillum 14-18 mm longum, lamina recurvata, 5-6 mm longa et lata, orbiculata, emarginata, basi rotundata. Alae 14-18 mm longae, lamina 4-6 mm longa et 1,5-2,5 mm lata, oblonga vel elliptica, apice rotundata. Carina 13-15 mm longa, lamina 3-4 mm longa et 2-2,5 mm lata, triangulari-obovata, apice brevissime rostrata. Legumina unilocularia, longe stipitata, 5-8,5 mm longa, 1,5-2 mm alta et 4-5 mm lata, dorsoventraliter compressa, valvis navicularibus nervosis, dense patule pilosis vel tomentosis. Semina immatura.

Pflanzen bis 20 cm hoch, von der Basis an dicht intricat verzweigt, mit dünnen Ästen. Haare weiß bis gelblich, sehr dünn und spitz, gerade bis bogig und v.a. an den Blättern auch gekräuselt, 0,1-1 mm, an den Blättchen bis 1,5 mm lang. Äste bis 10 cm lang, mit einem Zuwachs von 1-4 cm im ersten Jahr, 2-3 mm dick, von den Nebenblättern dicht umhüllt, darunter dicht wirr abstehend behaart; alte Äste schnell verkahlend, mit Resten von Nebenblättern und meist mehrere Jahre bleibenden Dornen. Nebenblätter häutig, gelblich, z.T. rot überlaufen, 2-5 mm lang, auf 0,5-2 mm mit dem Blattstiel verwachsen, darüber mit einem kurzen Hautsaum, auf der Gegenseite zu mehr als 1/2 ihrer Länge verwachsen, kurz zweizipfelig, dichthaarig, die unteren zerstreut behaart oder nur bewimpert. Blätter 1-7 cm lang; Rhachiden sehr dicht schräg aufrecht stehend bis zurück-gebogen, dicklich, starr und stechend bis schwach biegsam, im ersten Jahr dicht bis sehr dicht mit kurzen, wirr abstehenden bis filzigen und längeren anliegenden bis abstehenden Haaren besetzt; Blattstiel 1/3-1/2 der Rhachislänge erreichend; Enddorn bis 5 mal so lang wie die obersten Blätt-chen; Blättchen in 6-15 Paaren, sehr dicht, fast waagrecht stehend, sehr kurz gestielt, 1-5 mm lang und 1-3,5 mm breit, dicklich, gelblichgrau, mit oberseits hervortretenden, unter den Haaren ver-steckten Seitennerven, leicht zusammengeklappt, elliptisch bis fast rund, vorne gerundet, un-bespitzt oder mit winzigem Spitzchen, beiderseits sehr dicht von langen gekräuselten Haaren filzig-wollig bedeckt. Blütenstände die Blätter nicht überragend, locker 2-5-blütig; Achsen 2-5 cm lang, dicht bis sehr dicht kurz abstehend behaart. Brakteen häutig, hinfällig, 2-3 mm lang, eiförmig, zugespitzt. Brakteolen 1,5-3 mm lang, schmal eiförmig, wie die Brakteen dicht behaart. Blütenstiele 1-4 mm lang. Kelche zur Blütezeit 10-14 mm lang und 3-5 mm breit, röhrig, gelblich bis zart rot überlaufen, zur Fruchtzeit blasig vergrößert, 15-25 mm lang und 9-14 mm breit, ellipsoidisch, an den Zähnen zusammengezogen, derbhäutig, ganzflächig rotbraun, unter der Lupe fein marmoriert, mit ca. 25 deutlich hervortretenden Längsnerven und dazwischen etwas hervortretendem Netz, zur Blütezeit sehr dicht, zur Fruchtzeit lockerer kurz abstehend behaart; Zähne aus kurz dreieckiger Basis pfriemlich, 2,5-4 mm lang, 1/5-1/3 der Röhrenlänge erreichend. Kronblätter gelblichweiß. Fahne 14-18 mm lang; Platte 5-6 mm lang

und breit, rundlich, ausgerandet, gerundet in den keil-förmigen Nagel übergehend. Flügel 14-18 mm lang; Platten 4-6 mm lang und 1,5-2,5 mm breit, schmal länglich oder vorne etwas verbreitert; Nagel 10-12 mm lang; Öhrchen 0,2-0,7 mm lang. Schiffchen 13-15 mm lang; Platten 3-4 mm lang und 2-2,5 mm tief, verkehrt eiförmig-dreieckig, mit fast rechtwinkliger Unterkante und fast gerader Oberkante, vorne kurz geschnäbelt. Fruchtknoten sehr dicht behaart. Griffel bis zu 1/2 seiner Länge oder auch höher hinauf behaart. Früchte 5-8,5 mm lang, 1,5-2 mm hoch und 4-5 mm breit, wie die Fruchtknoten mit einem 1-3 mm langen Stiel, von oben deutlich zusammengedrückt, von oben betrachtet elliptisch bis breit elliptisch; Klappen stark gewölbt, strohgelb, hart, mit Quernerven, dicht wirr abstehend kurzhaarig bis filzig; Schnabel ca. 1 mm lang. Samen unreif.
Blüte- und Fruchtzeit: -V-VI-. Vorkommen: Hänge mit *Quercus persica*, 1400-1700 m.

Verbreitung:
Kurdisch-lurisches Verbreitungsmuster.

Gesehene Belege:
Iran: Prov. Bakhtaran: 43 km SW Kermanshah, 1680 m, 14.6.1959, *Pabot 1871* (= *12450-E)* (IRAN: Holotypus, G, W: Iso) -- entre Kermanshah et Gasr-e-Shirin, 37 km SW de Kermanshah, 1540 m, 24.6.1965, *Seraj* in Hb. PABOT *SJ III a/1* (G).
Prov. Lorestan: Beluran, SW of Kuh-e-Dasht, 33/21 N-47/30 E, c. 1450 m, 16.6.1959, *Wendelbo 2011* (BG, W).

Die neue Art ist *A. tortuosus* DC. sehr nahestehend: ähnlicher Habitus, stengelumfassende, auf der Gegenseite hoch verwachsene Nebenblätter, gleiche Blättchenform, Behaarung und Blüten-form. Sie unterscheidet sich jedoch von *A. tortuosus* durch kurze, die Blätter nicht überragende, wenigblütige Blütenstände, kurze Kelchbehaarung und kleinere Platten der Kronblätter, ein Merkmal, das sie auch von den anderen Arten der Sektion abhebt. Die Art setzt das Areal von *A. tortuosus* (SE-Türkei und NE-Irak bis ins iranische Kordestan) nach SE hin bis Lorestan fort. Für die beiden Arten ergibt sich so insgesamt ein typisches kurdisch-lurisches Verbreitungsmuster. Mit dem im gleichen Gebiet vorkommenden *A. flexilipes* Bornm. ist die neue Art nicht näher verwandt. Sie unterscheidet sich von ihr durch den Habitus, die Form der Nebenblätter und Blüten wie auch durch die Größe der Kelche.

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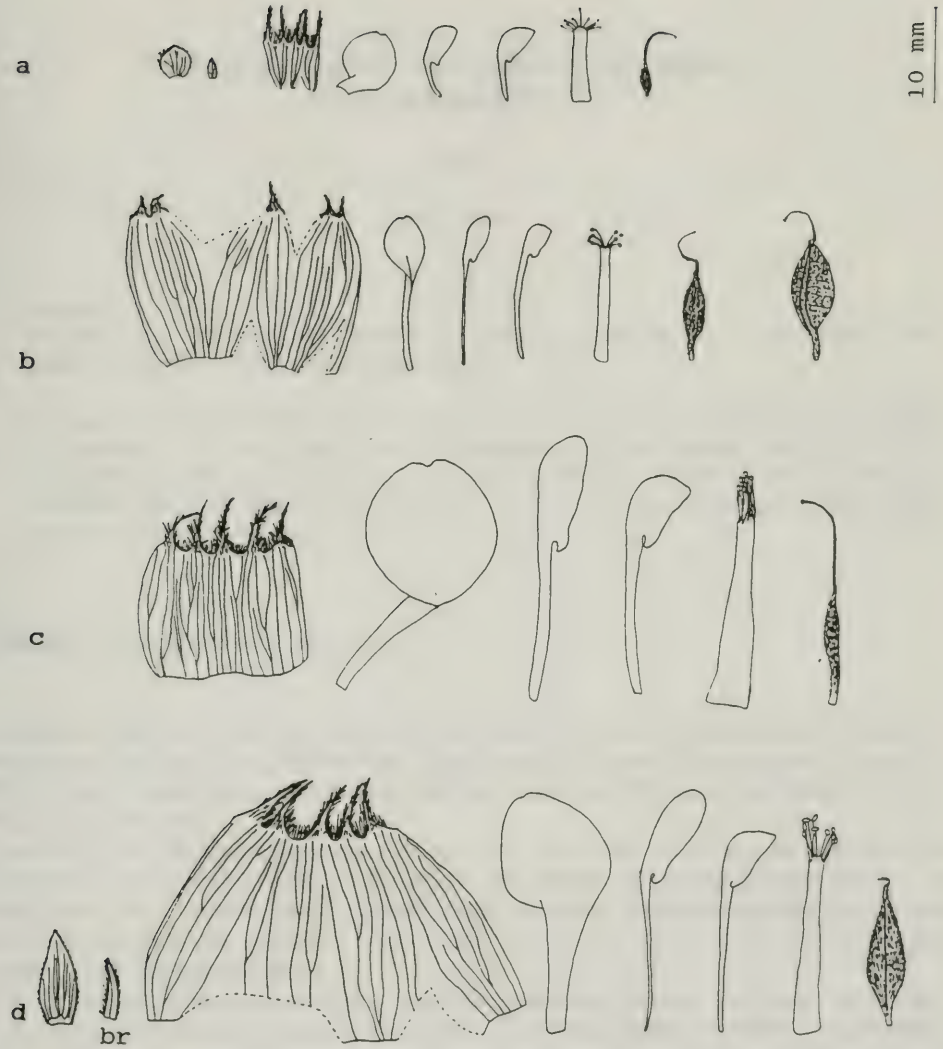

a. *A. brevirhachis*: Blüte, Brakteen der unteren und oberen Blüten des Blütenstandes (*Mozaffarian 5202*: TARI).
b. *A. pseudotortuosus*: Blüte (*Pabot 1871:* G) und reife Frucht, *Pabot SJ III a/l* in Herb. PABOT: (G)
c. *A. ghashghaicus*: junge Blüte (*Reino Alava 13657*: TUR).
d. *A. ghashghaicus*: ältere Blüte mit Brakteolen, br. und Brakteen, (*Rechinger 47424*: W).

Beiträge zur Kenntnis der Gattung Astragalus L. (Leguminosae) III- VI

von

D. PODLECH

Abstract:
PODLECH, D.: Beiträge zur Kenntnis der Gattung Astragalus L. (Leguminosae) III-VI. Sendtnera 1: 267-272. 1993. ISSN 0944-0178.

III: The systematic position of *Astragalus lusitanicus* Lam. as a member of the tribe *Sophoreae* is discussed. - IV: New names and combinations within the genera *Astragalus* L. and *Astracantha* Podlech are introduced. - V: The taxonomic position of some hitherto not recognised names of LINNE is discussed. - VI. *Astragalus coluteocarpus* Boiss. subsp. *heratensis* Podlech is described.

III. Was ist Astragalus lusitanicus Lam. ?

Astragalus lusitanicus Lam. ist eine große, stattliche Pflanze, die im westlichen Mittelmeergebiet schon früh Beachtung gefunden hat. LINNE beschrieb sie als *Phaca baetica*, LAMARCK mußte bei der Überführung in die Gattung einen neuen Namen wählen, da *Astragalus boeticus* L. bereits vergeben war.

Innerhalb der Gattung *Astragalus* war unsere Art vor allem wegen der großen, aufgeblasenen, unilokulären Hülsen und wegen des schiefen glockigen Kelches immer ein Fremdkörper, was BOISSIER, den hervorragenden Kenner der Gattung veranlaßte, für sie eine eigene Gattung *Erophaca* zu bilden. Dennoch galt die Art bis heute unangefochten als eine Vertreterin der Gattung *Astragalus*.

Eine genaue Merkmalsanalyse ergab jedoch eine Reihe auffallend abweichender Merkmale, so daß die Zugehörigkeit zur Gattung *Astragalus* nicht länger aufrecht erhalten werden kann. Seitlich angeheftete und schwach gehöckerte Kelche mit schief abgeschnittener Öffnung finden sich zwar in einigen basalen Gruppen der Gattung sowie in deren Verwandtschaft bei *Chesneya* und *Gueldenstaedtia*, jedoch verbietet dieses Merkmal in Verbindung mit anderen, bisher übersehenen Charakteren eindeutig einen Verbleib in der Tribus der *Galegeae*, zu der *Astragalus* und Verwandte zu rechnen sind. Der Besitz pulvinater Blattbasen sowie das Auftreten einer kleinen Caruncula um das Hilum des Samens verweisen die Gattung in die Verwandtschaft von *Sophora*, mit deren Arten *A. lusitanicus* auch habituell große Ähnlichkeiten aufweist. Eine Zuordung von *A. lusitanicus* zur Gattung *Sophora* ist jedoch nicht möglich, da deren Arten ein Andrözeum aus 10 verwachsenen Staubblättern besitzen, unsere Art dagegen 9 verwachsene und 1 freies Staubblatt aufweist. So wird es am zweckmäßigsten sein, die Art in der von BOISSIER geschaffenen Gattung *Erophaca* zu belassen, diese aber von den *Galegeae* zu den *Sophoreae* zu transferieren.

Erophaca Boiss., Voy. Bot. Esp. 2: 176. 1840 ≡ *Astragalus* L. sect. *Erophaca* (Boiss.) Boiss., Fl. Or. 2: 210. 1872. Typus und einzige Art: *Erophaca baetica* (L.)Boiss.

Erophaca baetica (L.)Boiss., Voy. Bot. Esp. 2: 177. 1840 ≡ *Phaca baetica* L., Sp. Pl.: 755. 1753 ≡ *Astragalus lusitanicus* Lam., Encycl. Méth. Bot. 1: 312. 1783 ≡ *A. dorycnioides* Scop., Delic. Insubr. 2: 104. 1786 ≡ *Colutea baetica* (L.)Poiret, Encycl. Méth. Bot. Suppl. 1: 561. 1810. Typus: noch nicht gewählt.

Pflanzen ausdauernd,mit sehr dünnen, weichen, bis 1,5 mm langen weißen, im Inflorescenzbereich meist bräunlichen bis schwarzen Haaren besetzt. Stengel 30-70 cm hoch, aufrecht, dick, sehr schwach kantig gefurcht, locker bis ziemlich dicht anliegend bis wirr abstehend behaart, im Alter oft verkahlend. Nebenblätter grünlich, rasch nach bräunlich verfärbend, 5-14 mm lang, die unteren breit-dreieckig,, zugespitzt, die oberen schmaldreieckig bis linealisch, spitz, unter sich und vom Blattstiel frei, gewimpert. Blätter auf kleinen Erhebungen (pulvinus) sitzend, 8-13 (-18) cm lang; Blattstiel 1,5-2 cm lang, kaum länger als der Blättchenabstand, wie die Rhachis oberseits deutlich gefurcht, spärlich bis ziemlich dicht fast anliegend behaart. Blättchen in 7-12 Paaren, mit einem dicklichen, 1-2 mm langen, am Grunde deutlich eingeschnürten und auf einer deutlichen Erhebung der Rhachis sitzenden Stielchen, das Endblättchen am Ende eines deutlichen Rhachisabschnittes ebenfalls gegliedert abgesetzt, alle 12-25 mm lang und 4-10 mm breit, schmalelliptisch, vorne spitz bis gerundet oder seltener schwach ausgerandet, meist mit einem kleinen Spitzchen versehen, oberseits sehr dicht fein dunkel punktiert und daher schmutzig-dunkelgrün aussehend, kahl, unterseits heller graugrün, locke bis ziemlich dicht anliegend bis halbabstehend behaart (subsp. *baetica*) oder oberseits locker bis dicht und unterseits bis sehr dicht anliegend behaart (subsp. *orientalis*). Blütenstände im mittleren Teil des Stengels blattachselständig, mit einem 2,5-8 cm langen, zur Blütezeit dünnen, sich später verdickenden, wie der Stengel behaarten Stiel, ziemlich dicht vielblütig, einseitswendig. Brakteen grünlich, rasch bräunlich verfärbend, 5-10 mm lang, linealisch, spitz, weiß- und schwarzhaarig. Blütenstiele 6-12 mm lang, aufrecht oder zurückgebogen, anfangs dünn, sich später verdickend, dicht schwärzlich behaart. Brakteolen linealisch, 2-3 mm lang, am Grunde des Kelches ansitzend. Kelch 8-11 mm lang, schiefglockig, mit einem schräg abgeknickt ansitzenden Blütenstiel, mit schwächer gebogener Bauchseite und stärker gebogenen Rückenseite, oben sehr schief abgeschnitten, die 3 rückenseitigen Zähne pfriemlich, sehr nahe beieinander stehend, die bauchseitigen aus dreieckigem Grund pfriemlich verschmälert, von den 3 rückenständigen durch eine breite, untereinander durch eine sehr breite Bucht getrennt, 2-3 mm lang; der ganze Kelch locker bis ziemlich dicht mit sehr kurzen, schwärzlichen Haaren bedeckt. Krone kahl, gelb, beim Abblühen bräunlich verfärbend. Fahne 25-31 mm lang; Platte 15-19 mm breit, verkehrteiförmig, vorne tief eingeschnitten, am Grunde keilig in den kurzen Nagel verschmälert. Flügel 23-29 mm lang; Platte schmallänglich, vorne gerundet, an der Basis fast quergestutzt mit einem wenig abgesetzten Öhrchen, 13-15 mm lang und 4-5 mm breit; Nagel 10-14 mm lang. Schiffchen so lang wie die Flügel; Platten schiefelliptisch-dreieckig, mit breit gebogener Unterkante und gerader Oberkante, vorne breit gerundet, 12-14 mm lang und 6-8 mm tief; Örchen sehr breit, dreieckig, 2-3 mm lang, Nagel 11-15 mm lang. Staubfadenröhre sehr ungleich hoch verwachsen, die beiden randständigen freien Filamentenden sitzen etwa in 2/3 der Höhe an. Fruchtknoten ca. 5-6 mm lang gestielt, dicht behaart; Griffel lang, dünn, weit hinauf behaart. Früchte 6-11 mm lang gestielt, schmallänglich bis verkehrteiförmig, mit fast gerader bis schwach gebogener Bauch- und Rückenlinie, zunächst von den Seiten her zusammengdrückt, flach, später aufgeblasen, am Grunde plötzlich oder allmählich in den Stiel verschmälert, vorne gerundet oder zugespitzt, mit einem 2-4 mm langen, aufgesetzten Schnabel, 50-70 mm lang, 17-23 mm hoch und 16-18 mm breit, an der Bauchseite und am Rücken breit gerundet bis sehr schwach gekielt; Klappen dünn,

zäh, mit schwachen, schräg verlaufenden Wülsten, gewölbt, trübbraun, mit lockerer bis dichter, sehr kurzer, anliegender bis wirr abstehender Behaarung. Hülse sich an Bauchnaht und Rücken öffnend, einfächerig. Samen elliptisch-nierenförmig, 5-6 mm lang, ca. 4 mm breit und 3 mm dick, braun, matt, mit einer kleinen, spitzen Caruncula oberhalb des Hilums.

Die Art kann in zwei geographisch getrennte Unterarten gegliedert werden:

E. baetica subsp. **baetica** (Synonyme siehe unter der Art).

Haare an Stengel und Rhachis bis 1,5 mm lang. Blättchen auf der Oberseite kahl. Hülsen locker bis ziemlich dicht behaart.

Blütezeit: II-IV. Vorkommen:
Verbreitung: Portugal, Spanien, Marokko, Algerien.

Erophaca baetica subsp. **orientalis** (Chater & Meikle)Podlech, comb. nov. ≡ *Astragalus lusitanicus* Lam. subsp. *orientalis* Chater & Meikle in Feddes Repert. 79: 48. 1968. **Holotypus**: In Monte Malevo Laconiae prope Hagios Joannis, 3000', 19.4./1.5.1857, *Orphanides*, Fl. Graeca Exsicc. no. *618* (K!).

Haare, vor allem an Stengel und Rhachis meist viel kürzer, nur 0,3-0,5 mm lang, viel dichter stehend. Blättchen oberseits dicht anliegend behaart, unterseits dichter behaart als bei der Typusunterart. Hülsen dicht, fast filzig behaart. Etwa einen Monat später blühend als die Typusunterart.
Blütezeit: IV - V.
Verbreitung: Griechenland, Türkei, Cypern, Libanon.

In Algerien, vor allem in der Umgebung von Alger treffen beide Unterarten zusammen. Hier finden sich auch Übergangsformen mit schwach behaarter Blättchenoberseite, jedoch den längeren Haaren der Typusunterart!

IV. Neue Namen und Kombinationen in den Gattungen Astragalus L. und Astracantha Podlech

Astracantha breviflora (DC.)Podlech, comb. nova
Basion.: *Astragalus breviflorus* DC., Astragal.: 194. (15.XI.) 1802 ≡ *Astragalus eriocephalus* Willd., Sp. Pl. 3: 1333. (1.-10.XI.) 1802, nom. illeg. [non *A. eriocephalus* Waldst. & Kit. (1801)] ≡ *Astracantha eriocephala* (Willd.)Podlech in Mitt. Bot. Staatss. München 19: 10. 1983.

Astragalus breviflorus DC. und *A. eriocephalus* Willd. basieren beide auf 'Tragacantha orientalis, foliis angustissimis flore purpurascente' Tournefort und sind somit homotypisch. Der um wenige Tage ältere Name von WILLDENOW kann wegen des älteren Homonyms von WALDSTEIN UND KITAIBEL nicht zur Anwendung kommen. Daher muß der Name von DECANDOLLE aufgenommen werden.

Astracantha parnassi (Boiss.)Podlech subsp. **calabricus** (Fisch.)Podlech, comb. nova. Basion.: *Astragalus calabricus* Fisch. in Bull. Soc. Imp. Naturalistes Moscou 26: 402. 1853 ≡ *A. siculus* Raf. subsp. *calabricus* (Fisch.)Arcang., Comp. Fl. Ital., ed. 2: 511. 1894 ≡ *Astracantha thracica* (Boiss:)Podlech subsp. *calabrica* (Fisch.)Greuter in Willdenowia 15: 426. 1986 ≡ *Astragalus siculus* Raf. var. *calabrus* auct. non Ten., Fl. Napol. 5: 134. 1835, [nom. inval.] ≡ *A. parnassi* Boiss. subsp. *calabrus* Chater in Feddes Repert. 79: 49. 1968, nom. illeg. ≡ *Astracantha parnassi* (Boiss.)Podlech subsp. *calabra* Podlech in Mitt. Bot. Staatss. München 19: 17. 1983, nom. illeg.

Wie GREUTER (1986) gezeigt hat, ist *Astragalus siculus* var. *calabrus* Ten. ein invalider Name und die Kombination unter *Astracantha parnassi* (Boiss.)Podlech illegitim. Da diese Sippe entgegen der Meinung von GREUTER nicht zu *Astracantha thracica* sondern zu *Astracantha parnassi* zu stellen ist (siehe REER & PODLECH) war die Neukombination notwendig geworden.

Einige altbekannte *Astragalus*-Namen müssen aus nomenklatorischen Gründen durch andere oder neue Namen ersetzt werden:

Astragalus altaicola Podlech, nom. nov. ≡ *A. altaicus* Bunge in Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 37. 1868 in clave et l.c. 15 (1): 46. 1869 non Pallas (1800-1802).

Astragalus floridulus Podlech, nom. nov. ≡ *A. floridus* Bunge in Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 24. 1868 in clave et l.c. 15 (1): 28. 1869 non Scop., Delic. Insubr. 2: 108. 1786 [quod est *A. christianus* L.]

Astragalus laxmanni Jacq., Hort. Vindob. 3: 22, tab. 37. 1770.
≡ *A. adsurgens* Pall. var. *laxmanni* (Jacq.)Trautv. in Bull. Soc. Imp. Naturalistes Moscou 31 (1): 491. 1860, nom. illeg.. **Lectotypus** (hoc loco designatus): [Planta culta in Horto Vindobonensi e seminibus a LAXMANN e Sibiria (Samen von PALLAS erhalten, siehe PALLAS, Sp. Astragal. p. 39. 1800)]. Specimen a JACQUIN missum (BM!).
= *A. adsurgens* Pall., Sp. Astragal.: 40. 1800 ≡ *A. laxmanni* Jacq. var. *adsurgens* (Pall.)Kitag. in J. Jap. Bot. 19: 106. 1943. **Typus**: Transbaicalia, ad Selengam, *Pallas* (BM!); Onenem circa Tareinoor, *Pallas* (BM!); Syntypen. **Lectotypus** (hoc loco designatus): ad Selengam, *Pallas* (BM!).

Sowohl die kolorierte Tafel bei JACQUIN und das von JACQUIN stammende Exemplar in BM, das hier zum Typus von *A. laxmanni* gewählt wird, als auch die von PALLAS gesammelten Syntypen von *A. adsurgens* (BM) gehören ein und derselben Art an. Dies wird zwar in der alten Literatur verschiedentlich festgestellt, jedoch wird die Art in allen neueren Florenwerken unter dem jüngeren Namen *A. adsurgens* Pall. geführt.

V. Über einige bisher nomenklatorisch nicht berücksichtigte Astragalus-Namen von LINNE

Astragalus microphyllus L., Sp. Pl.: 757. 1753. **Typus**: LINNE 926.17 [ein im Hortus Upsaliensis kultiviertes Exemplar].

Die Angabe 'e Sibiria' deutet daraufhin, daá LINNE Samen seiner Art möglicherweise von GMELIN erhalten hat. GMELIN zitiert auch in Fl., Sibirica 4: 41 unter seiner Nr. 54 ["Astragalus caulibus procumbentibus, pedunculis foliis longioribus, spicis ovatis, glaberrimis"] die LINNE'sche Phrase für *Astragalus microphyllus* aus Sp. Pl. 2: 1067, no. 13 "Astragalus caulescens erecto patulus, foliolis ovalibus, caulibus tumidiusculis, leguminibus subrotundatis". Die GMELIN'sche Art wird von LEDEBOUR (1841) als *Astragalus laxmanni* Pall. identifiziert. Die Pflanze im LINNE-Herbar hat aber mit dieser medifix behaarten und zur Sect. *Onobrychoidei* gehörenden Art überhaupt nichts zu tun, sondern ist basifix behaart und gehört eindeutig zu *Astragalus cicer* L. Möglicherweise ist GMELIN eine Verwechslung unterlaufen, die zu dieser Konfusion geführt hat. Lediglich ASCHERSON und GRAEBNER haben die Zugehörigkeit von *A. microphyllus* L. zu *A. cicer* L. erkannt und ihn als Varietät letzterer Art untergeordnet. Somit ergibt sich folgende Synonymie:

Astragalus cicer L., Sp. Pl.: 757. 1753
= *A. microphyllus* L., Sp. Pl.: 757. 1753 ≡ *A. cicer* L. var. *microphyllus* (L.)Asch. & Graebn., Syn. Mitteleurop. Fl. 6 (2): 771. 1909.

Astragalus tenuifolius L., Sp. Pl., ed. 2: 1065. 1763. **Typus** LINNE 926.10 [wohl eine Pflanze von GMELIN e Sibiria].

Diese Art fehlt in GMELIN, Fl. Sibirica, so daß von dorther keine weiteren Informationen zu erhalten sind. Der Typus im LINNE-Herbar gehört eindeutig zu *Astragalus austriacus* Jacq., Enum. Stirp. Vindob.: 263. 1762. Somit ist *A. tenuifolius* L. ein späteres Synonym von *A. austriacus* Jacq.

Astragalus tragacanthoides L., Sp. Pl.: 762. 1753. **Lectotypus**: LINNE 926.61. [Diesen Beleg hat LINNE von GMELIN aus Sibirien erhalten].

Die übrigen Elemente des Protologs, nämlich TOURNEFORT 'Astragalus acaulos, flore luteo', Cor. 28 [= *A. pinetorum* Boiss. subsp. *declinatus* Podlech, siehe PODLECH 1988] und BUXBAUM, Cent. 3, p. 21, t. 38. f. 2 [= ?] gehören zu anderen Arten. GMELIN zitiert die Phrase bei LINNE 'Astragalus subacaulos, floribus radicalibus numerosis subsessilibus' in seiner Fl. Sibirica 4: 52 unter der Nr. 67. Die hierher gehörende Pflanze wurde von LEDEBOUR (1841) als *Astragalus testiculatus* Pall. bestimmt. Sie ist identisch mit der Typuspflanze im LINNE-Herbar, die ebenfalls *A. testiculatus* Pall. darstellt. Somit ergibt sich folgende Synonymie:

Astragalus tragacanthoides L., Sp. Pl.: 762. 1753
= *A. testiculatus* Pall., Sp. Astragal.: 82, t. 67. 1802.

VI. Validisierung von Astragalus coluteocarpus Boiss. subsp. heratensis.

WENNINGER hat in seiner Revision von *Astragalus* L. sect. *Chlorostachys* Bunge, *Phyllolobium* Bunge und *Skythropos* Simpson (1992) eine neue Unterart von *Astragalus coluteocarpus* Boiss. eingeführt, ohne sie mit einer lateinischen Diagnose zu validisieren.

Astragalus coluteocarpus Boiss. subsp. **heratensis** Podlech, subsp. nov.

differt ab *A. coluteocarpus* Boiss. subsp. *coluteocarpus* corolla albida vix violacei-suffusa (nec flava demum violascente); vexillo rotundato-elliptico, 14-15 mm lato (nec obovato, 8-10 mm lato); foliolis haud raro per 3-4 verticillatis.

Holotypus: Afghanistan, Prov. Herat, Sabzak-Pass, 2200 m, 16.5.1969, *Hedge, Wendelbo & Ekberg W-8070* (GB; Iso: E).

Literatur:

GMELIN, J.G. 1769: Flora Sibirica vol. IV. Petropoli.

GREUTER, W. & TH. RAUS (ed.) 1986: Med-Checklist Notulae, 12. Willdenowia 15: 413-432.

PODLECH, D. 1988: Revision von Astragalus L. Sect. Caprini DC. (Leguminosae). Mitt. Bot. Staatss. München 25: 1-924.

REER, U. & PODLECH, D. 1986: Die europäischen Vertreter der Gattung Astracantha Podl. (Leguminosae). Mitt. Bot. Staatss. München 22: 513-569.

WENNINGER, J. 1991: Revision von Astragalus L. sect. Chlorostachys Bunge, Sect. Phyllolobium Bunge und Skythropos Simpson (Leguminosae). Mitt. Bot. Staatss. München 30: 1-196.

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Notes on the Genus Sagediopsis (Verrucariales, Adelococcaceae)

by

D. TRIEBEL

Abstract:
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Notes on the genus *Sagediopsis* are given. *Sagediopsis dissimilis* Triebel is described as a new species and treated in detail. This lichenicolous fungus is confined to the lecideoid lichen *Paraporpidia leptocarpa* and occurs in Australasia. *Sagediopsis* is closely related to *Adelococcus*. Both genera are placed in a new family of the Verrucariales, Adelococcaceae Triebel. The family includes lichenicolous, non-lichenized taxa with persistent interascal filaments.

1. Introduction

The order Verrucariales Mattick ex D. Hawksw. & O. Eriksson includes until now only one family, the Verrucariaceae Zenker, which comprizes mainly lichenized ascomycetes. It is characterized by globose, mainly clypeate and at least apically dark brown perithecioid ascomata. The hamathecial elements are confined to the ostiolar canal. The asci of the *Verrucaria*-type are broadly clavate, apically equally thick-walled and have constantly non-amyloid inner wall layers (see ERIKSSON 1981, HAWKSWORTH & ERIKSSON 1986). The hymenial gel and the external ascus wall layer frequently turn red in Lugol's iodine solution.

The majority of the c. 800 known Verrucarialean taxa develops two-biont lichen associations. Only a few lichenicolous lichens establishing three-biont associations are known (RAMBOLD & TRIEBEL 1992, checklist C). Just recently, some groups of non-lichenized fungi with lichenicolous, algicolous or hepaticolous life habit were placed in the order Verrucariales. These are the genera *Endococcus* Nyl., *Merismatium* Zopf, *Muellerella* Hepp ex Müll. Arg., *Norrlinia* Theissen & Sydow, and *Phaeospora* Hepp (ERIKSSON & HAWKSWORTH 1985, 1990, 1991, MATZER 1993a, MATZER & HAFELLNER 1990, TRIEBEL 1989). Also the genus *Lauderlindsaya* J.C. David & D. Hawksw. which was recently described (DAVID & HAWKSWORTH 1989) belongs to the Verrucariales and may comprize lichenicolous fungi. The biological behaviour of its species, however, and the acceptance of *Lauderlindsaya* is still discussed controversially (APTROOT 1989, DIEDERICH et al. 1991, DIEDERICH & SÉRUSIAUX 1993). The six genera with lichenicolous fungi mentioned above, belong according to their ascomatal and hymenial characters to the family Verrucariaceae.

MATZER & HAFELLNER (1990) enlarged the concept of the Verrucariales in that they placed a genus of lichenicolous fungi with more or less persistent interascal filaments, *Adelococcus* Theissen & Sydow, in this order. The genus *Sagediopsis* (Sacc.) Vainio is considered here as a further Verrucarialean genus with lichenicolous fungi, which is most closely related to *Adelococcus*. The characters which separate the Verrucarialean genera with lichenicolous fungi are given in table 1.

Tab. 1: Characters separating Verrucarialean genera with lichenicolous fungi [hal = halonate, sm = smooth, sr = slightly roughened]; for literature see DAVID & HAWKSWORTH (1989), DIEDERICH & SÉRUSIAUX (1993), HAWKSWORTH (1980), MATZER (1993a, b), MATZER & HAFELLNER (1990), ØVSTEDAL & HAWKSWORTH (1986), RAMBOLD et al. (1990), SANTESSON (1989), TRIEBEL (1989).

Genus (accepted species)	para-physoids	spores per ascus	ascospore pigmentation	spore septa transverse/ vertical	peri-/epi-spore structure
Adelococcus (2)	+	8	+	0-1/0	sr
Endococcus (8)	–	(4-) 8	+	1/0	sm/sr
Lauderlindsaya (3)	–	8	– (+)	3-7/0-1	sm
Merismatium (7)	–	8	+	3-9/0-3	sm/hal
Muellerella (8)	–	16-∞	+	0-4/0	sm/sr
Norrlinia (1)	–	2	–	12-20/0-7	sm
Phaeospora (3)	–	8	– (+)	3/0	hal
Sagediopsis (5)	+	8	– (+)	0-7/0	sm

2. The Genus Sagediopsis

The name *Sagediopsis* was introduced by SACCARDO (1905) as a subgenus of *Metasphaeria* Sacc. There it was used for lichenicolous pyrenomycetes with eight 2- to pluriseptate, hyaline ascospores per ascus and distinct interascal filaments. VAINIO (1921) raised it to generic status. This was not taken up by later authors, e.g. KEISSLER (1930). Meanwhile, *Sagediopsis* (Sacc.) Vainio has been reestablished and its generic concept has since been clarified (TRIEBEL 1989). *Leptorhaphis koerberi* B. Stein, growing on *Koerberiella wimmeriana* (Koerb.) B. Stein, was selected as the type species of *Metasphaeria* subg. *Sagediopsis* Sacc. by THEISSEN & SYDOW (1918: 28). TRIEBEL (1989: 109, 112) designated a neotype specimen for *Leptorhaphis koerberi* and found it to be a later taxonomic synonym of *Gongylia aquatica* B. Stein. The lectotype specimen of *Sagediopsis aquatica* (B. Stein) Triebel was found on a sterile crustose thallus which proved to be morphologically and chemically identical with *Koerberiella wimmeriana* (RAMBOLD et al. 1990).

The genus now comprizes lichenicolous species with relatively large, dark brown perithecioid ascomata and a characteristic pseudoparenchymateous ascomata wall structure. All species show more or less distinct paraphysoids, numerous periphysoids and periphyses. A characteristic hemiamyloid reaction of the hymenial gel is always observable, i.e. the gel turns red to red-violet in Lugol's iodine solution (Merck 9261; old herbarium specimens may react dirty bluish) and bluish in Lugol's solution, diluted 1:6. The asci are of the *Verrucaria*-type (i.e. clavate, thick-walled, mainly without a distinct internal beak) and 8-spored. The ascospores show a great variation with respect to their shape and number of septa. The type species (*S. aquatica*) and a second species (*S. barbara*) have narrowly fusiform to acicular, 3 (-7)-septate ascospores, whereas *S. campsteriana* and *S. fissurisedens* have ellipsoid, 3 (-4)-septate ascospores. Here, a further species is included. It has 0-1-septate, ellipsoid to ovoid ascospores but fits with the generic delimitation in all other features. The genus comprizes the following five species which can easily be distinguished by their host selection and ascospore measurements.

Sagediopsis aquatica (B. Stein) Triebel
≡ *Gongylia aquatica* B. Stein
= *Leptorhaphis koerberi* B. Stein
Host lichen: *Koerberiella wimmeriana* (Koerb.) B. Stein; ascospores narrowly fusiform to acicular, (0-) 3 (-6)-septate, (22-) 27-36 (-45) × (2.5-) 3-3.5 (-4) µm; for description see RAMBOLD et al. (1990); for nomenclature see AGUIRRE-HUDSON (1991 – sub *Leptorhaphis koerberi*), RAMBOLD et al. (1990), TRIEBEL (1989).

Sagediopsis barbara (Th. Fr.) R. Sant. & Triebel
= *Leptorhaphis steinii* Koerb.
= *Gongylia nadvornikii* Servit
= *Gongylia norvegica* H. Magn.
Host lichen: *Porpidia glaucophaea* (Koerb.) Hertel & Knoph; ascospores narrowly fusiform to acicular, (0-) 3 (-7)-septate, (20-) 27-39.5 (-46) × (3-) 3.5-4.5 (-5) µm; for description and nomenclature see AGUIRRE-HUDSON (1991 – sub *Leptorhaphis steinii*), TRIEBEL (1989).

Sagediopsis campsteriana (Lindsay) D. Hawskw. & R. Sant.
= *Metasphaeria tartarina* (Nyl.) Keissl.
Host lichens: *Ochrolechia frigida* (Sw.) Lynge, *O. lapuensis* (Räs.) Räs., *O. tartarea* (L.) Massal., *Ochrolechia* sp. Reports on *Lecanora hageni* (Ach.) Ach., e.g. by VEZDA (1970), should be confirmed by additional material. Reports on *Lecidea cinnabarina* Sommerf. must be rejected (HAFELLNER in litt.; TRIEBEL 1989); ascospores ellipsoid, (1-) 3 (-4)-septate, (12-) 15-20 (-25) × 4-6 µm; for description see HAWKSWORTH (1975 – sub *Metasphaeria tartarina)*, VEZDA (1970 – sub *Metasphaeria tartarina*); for nomenclature see ALSTRUP & HAWKSWORTH (1990), TRIEBEL (1989).

Sagediopsis dissimilis Triebel
Host lichen: *Paraporpidia leptocarpa* (Bab. & Mitt.) Rambold & Hertel; ascospores ellipsoid to ovoid, 0-1-septate, (7.5-) 8-10.5 (-12) × (4-) 4.5-6 (-6.5) µm; for description see further below.

Sagediopsis fissurisedens Hafellner ined.
Host lichen: *Aspicilia myrinii* (Fr.) B. Stein; ascospores ellipsoid, (1-) 2-3-septate, 12-17 × 5-8 µm; for description see HAFELLNER (in prep.).

All species of *Sagediopsis* so far known are highly specialized with respect to their hosts and confined on one species or one genus. The host lichens are saxicolous or terricolous, and develop thick crusts over acid substrates. The members of *Sagediopsis* are found in extra-tropical regions of the Northern Hemisphere, and, with *S. dissimilis*, also for the first time in the Southern Hemisphere.

3. The Species Sagediopsis dissimilis

Sagediopsis dissimilis Triebel – **sp. nov.**

Diagnosis: Ascomata perithecioidea, 0.15-0.25 mm in diametro, globosa vel pyriformia, atra, immersa, in thallis lichenis *Paraporpidia leptocarpa* vigentia. Apices ascomatum applanatae, ostiolo circa 15-30 µm in diametro. Paries ascomatum apicaliter fuscus, incrassatus, basaliter subfuscus, pseudoparenchymaticus, circa 25-35 µm crassus, e 7-10 stratis cellularum compositus. Cellulae circa 4.0-5.0 µm in diametro (lumina 2.0-3.5 µm). Subhymenium incoloratum. Gelatina hymenii in solutione ILugol1:6 dicta coerulescens, in solutione ILugol dicta rubescens. Periphysoides raro ramosae, circa 1.5 µm crassae (lumina circa 1.0 µm), paraphysoides raro ramosae, circa 1.0-1.5 µm crassae (lumina circa 1.0 µm). Asci clavati, crassitunicati, circa 35-48 µm longi et 10-11 µm lati, octospori. Ascosporae (7.5-) 8-10.5 -12) × (4-) 4.5-6 (-6.5) µm magnae, late ellipsoidales vel ovoideae, non septatae vel uniseptatae, (septum pro parte amediatum et leviter curvatum). Paries ascosporarum incoloratus, raro subfuscus, circa 0.5-1.0 µm crassus, perisporio laevi.

Type: Australia: Queensland: Mt Coolum, c. 90 km N of Brisbane, 26°34'S, 153°05'E, basaltic outcrops near summit in low heath, c. 180 m, 11 February 1986, *G. Rambold 4418* (M, holotypus).

Ascomata perithecioid, 0.15-0.25 mm diam., globose to pyriform, black, immersed in the thallus of *Paraporpidia leptocarpa*, erumpent. Apices of the ascomata more or less plane, ostiolum obvious, c. 15-30 µm diam. Ascomata wall apically up to 80 µm thick, brown to dark brown, at the base brown to pale brown, pseudoparenchymateous, 25-35 µm thick, composed of 7-10 cell layers; (see fig. 1a). Cells c. 4.0-5.0 µm diam. (lumina 2.0-3.5 µm), with irregularly thickened cell walls and small lumina. Hyphae around ostiolum elongated. Subhymenium colourless. Hymenial gel hemiamyloid, i.e. ILugol1:6 + bluish, ILugol + red or red-violet. IMelzer –. Hamathecium consisting of periphyses, periphysoids and paraphysoids. Periphysoids cellular, rarely branched, embedded in gel, c.1.5 µm thick (lumina 1.0 µm). Paraphysoids numerous, scarcely septate, rarely branched, c. 1.0-1.5 µm thick (lumina 1.0 µm) (see fig. 1b). Asci clavate, thick-walled (wall apically c. 2.5 µm thick), 35-48 × 10-11 µm, 8-spored (see fig. 1c). Ascospores (7.5-) 8-10.5 (-12) × (4-) 4.5-6 (-6.5) µm, broadly ellipsoid to ovoid, 0-1-septate, (septum sometimes slightly curved and amediate), colourless, rarely pale brown, often with 1-2 oil drops, thick-walled (c. 0.5-1.0 µm thick), with smooth perispore (see fig. 1d).

Hosts: *Paraporpidia leptocarpa* (Bab. & Mitt.) Rambold & Hertel.

Distribution: Known from Australia and New Zealand (see fig. 2).

Further specimens examined:

Australia: Queensland: Bellenden Ker Range, Bartle Frere North West Peak, 17°23'S, 145°48'E, exposed outcrops below peak, c. 1500 m, 1 March 1986, *G. Rambold 4839* (M). – Crystal Creek National Park, Paluma, 19°00'S, 146°13'E, exposed rocks at Witt's Lookout, c. 900 m, 25 February 1986, *G. Rambold 4799* (M). – New South Wales: New England National Park, Point Lookout, 30°29'S, 152°25'E, boulders in dry sclerophyll forest, 1530 m, 6 February 1986, *G. Rambold 4319* (UPS), 4327, 4328 (M). – New England National Park, Lyrebird Track, 30°30'S, 152°24'E, boulders in heath with *Banksia*, 1400 m, 6 February 1986, *G. Rambold 4349* (M). – Barrington Tops National Park, Gloucester Tops, Negrohead Beech Forest Walking Trail, 32°05'S, 151°35'E, mossy low boulders in temperate rainforest with *Nothofagus moorei*, c. 1200 m, 4 February 1986, *G. Rambold 4236* (M). – Blue Mountains National Park, near Glenbrook, c. 60 km W of Sydney, 33°46'S, 150°37'E, September

1981, *M. Mayrhofer 3269* (GZU). – Peakhurst near Sydney, 33°53'S, 151°13'E, 23 September 1900, [no collector] (BRI 354951). – Morton National Park, 8 km E of Nerriga, 35°05'S, 150°08'E, boulders in open *Eucalyptus* forest, 750 m, 23 January 1986, *G. Rambold 3904* (M). – Victoria: Great Dividing Range, Hanging Rock E of Woodend, about 70 km NE of Melbourne, volcanic rocks, 37°22'S, 144°40'E, c. 500 m, 18 July 1986, *J. Hafellner 15755 & R. Filson* (hb. Hafellner). – Cathedral Range, Mt Sugarloaf, 37°31'S, 147°42'E, on siliceous rocks, 800 m, 12 September 1987, *H.T. Lumbsch 5655 g* (hb. Lumbsch). – "On sandstone rock by stream Lorne ...", 38°32'S,143°58'E, May 1887, *F.R.M. Wilson* (NSW 155924). – **New Zealand**: South Island: Canterbury: Mt Peel, Lynn Stream Valley, Long Speer above Acland's hut, 43°50'30"S, 171°11'E, 15 January 1985, *H. Hertel 29431* (M).

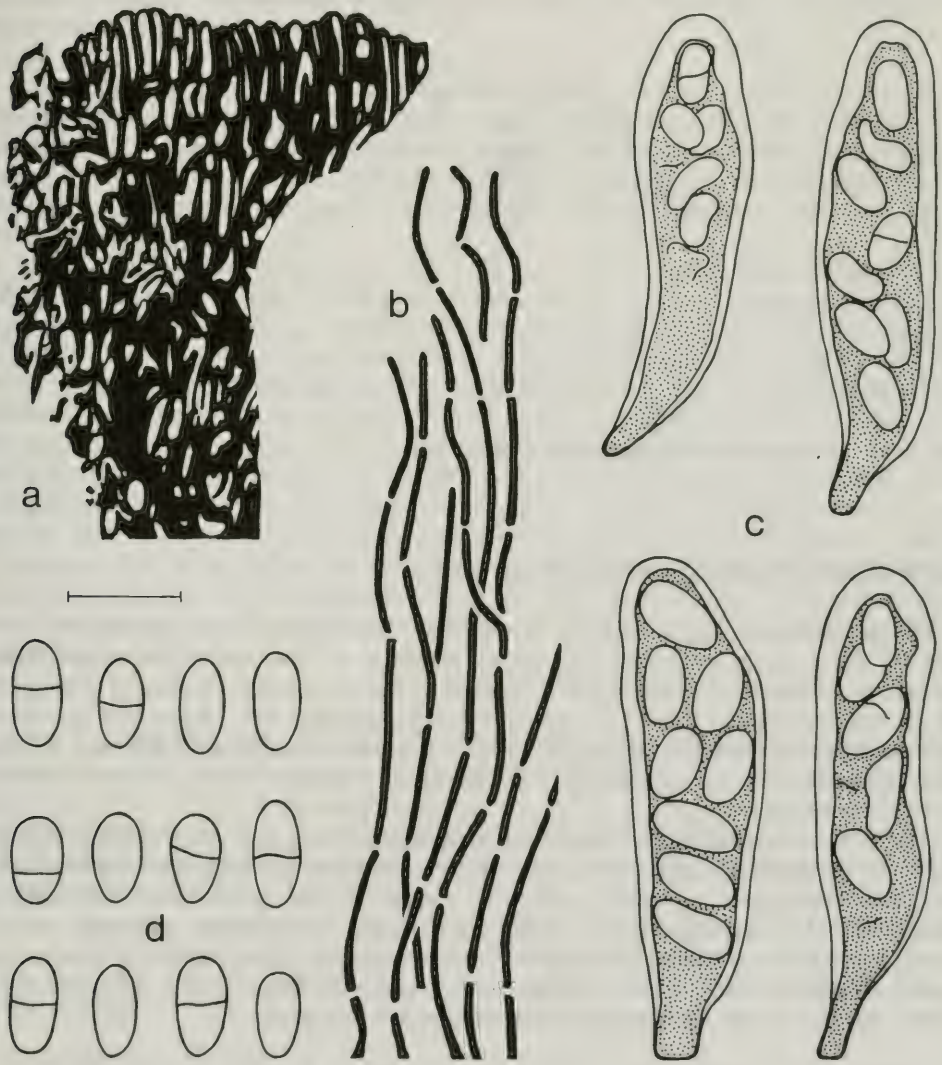

Fig. 1: *Sagediopsis dissimilis*: a) apical part of the ascomata wall; b) paraphysoids; c) asci; d) ascospores [a, c, d: in H_2O; b: in lactophenol cotton blue; *H. Hertel 29431* (M)]. – Scale: a: 18 µm; b-d: 10 µm.

Fig. 2: The distribution of *Sagediopsis dissimilis*.

4. The Natural Relationship of Sagediopsis

The genus *Sagediopsis* is most closely related to *Adelococcus* Theissen & Sydow. Up to now the latter genus comprizes two species occurring on crustose lichens on calciferous substrates: *Adelococcus alpestris* (Zopf) Theissen & Sydow, found on species of *Acarospora* (*A. glaucocarpa* (Ach.) Koerb., *A. macrospora* (Hepp) Bagl.) and *Adelococcus interlatens* (Arnold) Matzer & Hafellner which grows on *Clauzadea immersa* (Web.) Hafellner & Bellem., *Hymenelia prevostii* (Duby) Kremp. and *Sarcogyne regularis* Koerb. coll. (MATZER & HAFELLNER 1990).

Adelococcus and *Sagediopsis* have similar ascomata wall structures, develop periphyses and numerous persistent periphysoids, more or less persistent paraphysoids, thick-walled asci of the *Verrucaria*-type (i.e. mainly without a distinct internal apical beak) and show a characteristic hemiamyloid reaction of the hymenial gel. Distinguishing characters concern mainly spore features. Mature ascospores of *Adelococcus* are brown, slightly roughened and mostly nonseptate, whereas those of *Sagediopsis* are smooth-walled, mostly colourless and at least 1-septate (see tab. 1). Both genera are included in a new family.

Adelococcaceae Triebel – **fam. nov.**

Diagnosis: Ascomycetes ordinis Verrucariales lichenicoli, non-lichenisati. Ascomata perithecioidea, globosa vel pyriformia, atra. Paries ascomatum apicaliter fuscus, incrassatus,

basaliter fuscus vel subfuscus, pseudoparenchymaticus. Gelatina hymenii hemiamyloidea, i.e. in solutione ILugol1:6 dicta coerulescens, in solutione ILugol dicta rubescens. Periphyses et periphysoides numerosae, distinctae. Paraphysoides plus minusve distinctae. Asci clavati aut late cylindrici, crassitunicati, typo *Verrucaria* dicto.

Typus familiae: *Adelococcus* Theissen & Sydow – *A. alpestris* (Zopf) Theissen & Sydow.

A family of the order Verrucariales, hitherto comprizing lichenicolous, non-lichenized taxa. Ascomata perithecioid, globose to pyriform, black. Ascomata wall apically dark brown, thickened, basally dark brown to pale brown; pseudoparenchymateous. Hymenial gel hemiamyloid, i.e. ILugol1:6 + bluish, ILugol + red to red-violet. Periphyses and periphysoids numerous, distinct. Paraphysoids more or less distinct. Asci clavate or broadly cylindrical, thick-walled, of the *Verrucaria*-type.

The family Adelococcaceae includes the genera *Adelococcus* and *Sagediopsis*. Both genera exhibit characters regarded as primitive in the Verrucariales, like the occurrence of paraphysoids and the simple pseudoparenchymateous, aclypeate ascomata wall structure. These features correlate with the lichenicolous habit. The majority of Verrucarialean taxa is currently placed in the type family Verrucariaceae, which is considered still to comprize heterogenous elements.

The badly known, lichenized genus *Discocera* A.L. Sm. & Ramsb. may be related to the Adelococcaceae, as its only species *D. lichenicola* A.L. Sm. & Ramsb. has distinct periphysoids and paraphysoids, the characteristical hemiamyloid reaction of the hymenial gel and asci of the *Verrucaria*-type (RAMBOLD & TRIEBEL 1990, fig. 2d). Lichenicolous fungi which superficially resemble lichenicolous Verrucarialean taxa are currently placed in the Dothidealean families Dacampiaceae Koerb. (= Pyrenidiaceae A. Zahlbr.) and Mycosphaerellaceae G. Lindau. Both families include taxa which generally have non-amyloid, fissitunicate asci with a distinct internal apical beak, show no hemiamyloid reactions of the hymenial gel and no periphysoids. Their species may develop short periphyses confined to the ostiolar canal. The Dacampiaceae (e.g. *Dacampia* Massal., *Polycoccum* Sauter ex Koerb., *Pyrenidium* Nyl.) have distinct interascal filaments, whereas those of the lichenicolous taxa currently placed in the Mycosphaerellaceae (e.g. *Echinothecium* Zopf, *Sphaerellothecium* Zopf, *Stigmidium* Trev.) are lacking or soon becoming evanescent. Both families still include heterogenous elements.

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Further Species of the Genus Tephromela (Lecanorales)

by

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Abstract:
RAMBOLD, G.: Further species of the genus Tephromela (Lecanorales). – Sendtnera 1: 281-288. ISSN 0944-0178.

Character and distribution data of four species of *Tephromela* are presented. Three lichenicolous species which have recently been recognized as belonging to *Tephromela*, are described in detail: *Tephromela campestricola* (Nyl.) Rambold & Triebel, *T. cerasina* (Müll.Arg.) Rambold & Triebel, and *T. koliensis* (Räs.) Rambold & Triebel. The inclusion of these taxa without visible thallus entailes an enlargement of the genus concept. *Tephromela colensoica* Rambold & Knoph is described as new. *Lecidea aterrima* Fée is recognized as a member of *Tephromela atra* agg.

1. Introduction

Since characters of the ascus apex have been recognized as systematically important, profound changes in the generic concepts of crustose lichens have taken place. Artificial genera like *Aspicilia*, *Lecanora* or *Lecidea* have been split up into smaller, more natural entities. This has also happened with various lichenicolous lecanoralean taxa without visible thallus, like the species formerly included in the genus *Nesolechia*.

Before *Tephromela* was reestablished (HAFELLNER in KALB 1983, HAFELLNER 1984), the species of this genus were located in various genera. Meanwhile it became evident that beside species of the lecanoroid type, ones of the aspicilioid-lecanoroid and lecideoid type also belong to this genus (HERTEL 1984, HERTEL & RAMBOLD 1985). This means that the margination type of the apothecia is not necessarily a major important character at generic level in this group of Lecanorales. Therefore, some former members of the genera *Lecanora*, *Lecidea* and *Nesolechia* have to be included in *Tephromela*.

The saxicolous species *Tephromela colensoica* which is described here as new, and the three obligately lichenicolous species which have recently been combined in *Tephromela*, have apothecia without lecanorine margins. Furthermore, the three lichenicolous species exhibit no distinct thallus. Their inclusion in *Tephromela* entailes an enlargement of the generic concept. The only lichenicolous species of the genus hitherto known is *T. armeniaca* (DC.) Hertel & Rambold, which occurs facultatively on *Sporastatia testudinea* (Ach.) Massal., always develops an extended proper thallus but also has apothecia with biatorine margins. The major differentiating characters of the lichenicolous species with indistinct thallus are given in table 1. The spectrum of thallus organization in *Tephromela* is very similar to that of two other lecanoralean genera, *Carbonea* and *Rhizocarpon*, which include species with a visible (epikapylic) as well as with an invisible (endokapylic) thallus (for definitions see RAMBOLD & TRIEBEL 1992).

Table 1: The major differentiating characters of the lichenicolous endokapylic species of *Tephromela* (violet pigmentation of hymenium and epihymenium, average ascospore size, host selection).

	Hym. vio.	Epih. vio.	Av. ascospore size [µm]	host species
T. campestricola	+	+	9.0-10.5 × 5.0-5.5	*Lecanora pseudistera, L.* sp.
T. cerasina	±	+	7.5- 8.5 × 5.0-6.5	*Dirinaria picta*
T. koliensis	–	–	12.0-13.0 × 6.0-6.5	*Lecanora argopholis*

Chemical and morphological data of *Lecanora cavicola* Creveld (CREVELD 1981, POELT & LEUCKERT 1984) suggested that the species might belong to *Tephromela*, combining the presence of alectorialic acid (the major substance in *T. armeniaca*) with a lecanorine margin. However, by its paraphyses, conidia and conidiophores, this species is closer to *Lecanora* s.l. Also the asci resemble those of the *Lecanora marginata* group.

The genus *Tephromela* is delimited here in the following way: autotrophic or lichenicolous, epikapylic or endokapylic, cecidogenous or not; apothecia immersed to sessile, aspicilioid, biatorine to lecanorine; paraphyses thick-walled, colourless to violet-brown, apically greenish to black-violet; asci of *Bacidia*-type; ascospores simple, very rarely one-septate; conidia cylindrical, usually developing laterally on the conidiophores.

2. The Species

Tephromela campestricola (Nyl.) Rambold & Triebel, Biblioth. Lichenol. **48**: 169. 1992 ≡ *Lecidea campestricola* Nyl., Flora **67**: 389. 1884 ≡ *Phacopsis campestricola* (Nyl.) Vouaux, Bull. Soc. Mycol. France **30**: 145. 1914. **Type:** France: Pyrénées Orientales, Força Réal, 2500 m, [on *Lecanora pseudistera* Nyl. – host lichen det. H.T. Lumbsch], 30 March 1884, *W. Nylander* (H-NYL 16854! – holotype, with drawings of the author; H-NYL 5887!, PC, hb. Hue! – isotypes).

Growing on the thallus and apothecia of *Lecanora pseudistera* and a related species, endokapylic, cecidogenous or not (fig. 1).

Apothecia round, dispersed to crowded, semi-immersed to sessile, not constricted at the base, c. 0.2-0.4 mm, max. 0.4-0.65 mm diam. Disc plane to convex, black, nitid, epruinose. Margin at first distinct or not, narrow, black, nitid, later evanescent. Excipulum max. 35-70 µm thick, lateral of the hymenium 25-40 µm thick. Ectal zone dark grey-green to violet-brown, pigmented zone c. 8-10 µm wide; hyphae 4-8 µm diam., with lumina of 2-2.5 µm diam. Inner zone pale violet to violet-brown; hyphae 3-5 µm diam., with lumina of 1-2 µm. Medullary zone not developed. Hypothecium pale yellowish-brown to brown, up to 150 µm thick; hyphae 4.5-6 µm diam.; subhymenial layer violet to violet-brown, up to 10 µm thick. Hymenium 40-70 µm high, violet, $I_{Lugol1:6}$ –, I_{Lugol} –. Epihymenium violet to violet-black, 7-15 µm high; pigmentation diffuse and cap-like in the apical wall of the paraphyses, radiating into the lower hymenium. Paraphyses branched, mostly not anastomosing, up to 4 µm, (lumina 1-2 µm), apical 4-6 µm (lumina 1-2.5 µm) thick (incl. the gallertic sheaths). Asci c. 30-53 × 8-13 µm; tholus max. 7-10 µm, min. 3-4.5 µm thick; outer amyloid wall layer 0.5 µm thick, $I_{Lugol1:6}$ +

blue, I_{Lugol} + brownish; non-amyloid wall layer c. 0.5 µm thick. Ascospores ellipsoid, simple, **7-9.0-10.5**-11 × 4.5-**5.0-5.5**-6 µm.

Pycnidia immersed in the thallus of the host lichen, c. 50 µm diam.; wall pseudoparenchymatic, violet-brown to grey-green in the upper part, hyaline in the lower part; conidiogenous hyphae similar to the *Tephromela*-type (HERTEL & RAMBOLD 1985: 489 fig. 7d-f). Conidia bacilliform, 7-9 × 0.5-1 µm.

Distribution: Known from Europe (France, Spain) and East Africa (Ethiopia).

Notes: *Tephromela campestricola* is characterized by its violet-brown hymenium, the elongate ascospores and its occurrence on *Lecanora pseudistera* and a related species. The endokapylic species occasionally causes gall-like thallus deformations of the host. The bacilliform conidia of this lichenicolous species were already described by NYLANDER (1884).

Further specimens examined:

France: Pyrénées Orientales, Amélie, super saxa aren. calcarea, 400 m, [on *Lecanora pseudistera*], 11 March 1884, *W. Nylander* (H-NYL 5888, H-NYL 16855). – **Spain**: Prov. Castellón, Alfondeguilla, Pico Femella, c. 40°N, 0°W, 400 m, on sun exposed orthocuasitic sandstone close to a cork-oak forest, [on *Lecanora pseudistera*] 20 January 1990, *V. Calatayud* (M, UPS). – **Ethiopia**: Bale Mountains: Finchaya Habera, 7°N, 39°44'E, 3500 m, secondary heathland and pastures between boulders, on S-facing slopes, accompanying crustose lichens on level rock surfaces, [on *Lecanora* sp., containing atranorin, zeorin], 28-29 December 1989, *G. & S. Miehe 297* (GZU).

Tephromela cerasina (Müll.Arg.) Rambold & Triebel, Biblioth. Lichenol. **48**: 170. 1992
≡ *Nesolechia cerasina* Müll. Arg. in Durand & H. Pittier, Bull. Soc. Roy. Bot. Belgique **30**(1): 72. 1891. **Type:** Costa Rica: San José, [on *Dirinaria picta* (Sw.) Clem. & Shear (= *Physcia picta* var. *sorediata* Müll.Arg.)], 1890, *H. Pittier 5263* (G! – holotype).

Growing on the thallus of *Dirinaria picta*, endokapylic, not cecidogenous (fig. 2).

Apothecia round, dispersed, crowded to confluent, sessile, not constricted at the base, c. 0.2-0.4 mm, max. 0.4-0.7 mm diam. Disc plane to convex, black, nitid, epruinose. Margin at first distinct or not, narrow, black, nitid, later evanescent. Excipulum max. 35-80 µm thick, lateral of the hymenium 25-40 µm thick. Ectal zone violet to orange-brown; hyphae 3-5 µm diam., with lumina of 1-2 µm diam. Inner zone orange to violet-brown, hyphae 3-4 µm diam., with lumina of 1-2 µm. Medullary zone not developed. Hypothecium orange to orange-brown, up to 110 µm thick; hyphae 2-4 µm diam.; subhymenial layer colourless to yellowish brown or pale violet, up to 15 µm thick. Hymenium 40-60 µm high, pale violet to violet, $I_{Lugol1:6}$ –, I_{Lugol} –. Epihymenium violet to violet-black, 8-15 µm high; pigmentation diffuse and cap-like in the apical wall of the paraphyses, radiating into the lower hymenium. Paraphyses branched, rarely anastomosing, 2-3 µm (lumina 1-2 µm), apical 3-5 µm (lumina 1-2 µm) thick (incl. the gallertic sheaths). Asci c. 35-53 × 10-14 µm; tholus max. 7-9 µm, min. 4-7 µm thick; outer amyloid wall layer 0.5-1 µm thick, $I_{Lugol1:6}$ + blue, I_{Lugol} + brownish; non-amyloid wall layer c. 0.5 µm thick. Ascospores ellipsoid to subglobose, simple, 6.5-**7.5-8.5**-10 × 4.0-**5.0-6.5**-7 µm.

Pycnidia not observed.

Distribution: The species occurs in both hemispheres and is known from Central and South America (Costa Rica, Venezuela, Brazil) and West Africa (Ivory Coast).

Notes: *Tephromela cerasina* combines the characters of a lichenicolous growth habit and a violet pigmented hymenium like *T. campestricola.* The ascospores are less elongate and no gall-like formations to the host species are observable. By its strict host selection and its anatomical characters, this species is easily to recognize.

Further specimens examined:

Venezuela: Ridgecrest, 6 mi NW of Maracay, 1000 m, on *Curatella delineacea*, 21 January 1969, *T.H. Nash III 1941* (ASU). – **Brasilia**: Rio Grande do Sul, Santa Maria da Rocca do Monte, 30 April 1897, *G.A. Malme 1284* (UPS). – **Ivory Coast**: Cercle of Daloa, Issia, 240-260 m, on a small tree in the outskirt of a low wood close to open rocks, 2 August 1954, *R. Santesson 10403c* (UPS).

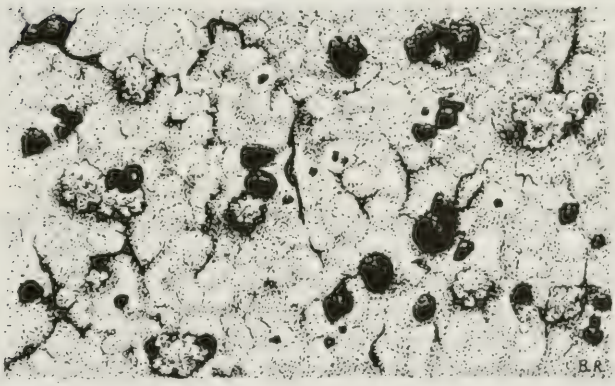
Tephromela koliensis (Räs.) Rambold & Triebel, Biblioth. Lichenol. **48**: 170. 1992.
≡ *Nesolechia koliensis* Räs., Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo **12**(1): 156. 1939.
Type: Finland: Karelia borealis, Pielisjärvi, Koli, [on *Lecanora argopholis* (Ach.) Ach. (sterile)], 12 June 1924, *V. Räsänen* (H! – holotype).

Growing on the thallus of *Lecanora argopholis*, endokapylic, not cecidogenous (fig. 3).
Apothecia round, dispersed or not, semi-immersed to sessile, not constricted at the base, c. 0.15-0.25 mm, max. 0.25-0.35 mm diam. Disc plane to convex, black, nitid, epruinose. Margin at first distinct or not, narrow, black, nitid, later evanescent. Excipulum max. 20-25 µm thick, lateral of the hymenium 20-25 µm thick. Ectal zone red to reddish brown; pigmented zone c. 7-10 µm wide; hyphae 3-7 µm diam., with lumina of 1-2.5 µm diam. Inner zone pale brown to yellowish brown, hyphae 3-5 µm diam., with lumina of 1-2 µm. Medullary zone not developed. Hypothecium pale brown, yellow- to orange-brown, up to 120 µm thick; hyphae 4-7 µm diam.; subhymenial layer yellow-brown or not distinct. Hymenium 45-55 µm high, colourless to pale brownish, $I_{Lugol1:6}$ –, I_{Lugol} –. Epihymenium greyish to olivaceous brown, c. 10 µm high; pigmentation diffuse and cap-like in the apical wall of the paraphyses, radiating into the lower hymenium. Paraphyses poorly branched, mostly not anastomosing, c. 2 µm (lumina 1-2 µm), apical 4-7 µm (lumina 1.5-2 µm) thick (incl. the gallertic sheaths). Asci c. 30-55 × 9-13 µm; tholus max. 8-13 µm, min. 5-9 µm thick; outer amyloid wall layer 0.5-1 µm thick, $I_{Lugol1:6}$ + blue to brownish blue, I_{Lugol} + brownish; non-amyloid wall layer c. 0.5 µm thick (masse axiale not clearly obvious). Ascospores ellipsoid, simple, very rarely one-septate, (9-) **12-13** (-16) × (5-) **6-6.5** (-7) µm.
Pycnidia not observed.

Distribution: Known from Finland.

Notes: *Tephromela koliensis* does not show a strong violet-brown pigmentation of the paraphyses in contrast to the other two lichenicolous species treated in this paper. The hymenium is either colourless or has only a slight brownish tinge. The ascospores of this species are relatively large. All specimens examined grow on a sterile subfruticose lichen thallus, containing atranorin, zeorin and fatty acids, which most likely belong to the chemodeme II of *Lecanora argopholis* (VÄNSKÄ 1984). One host specimen (leg. *S. Ahlner*, 24 August 1936, H) is also infected by the lichenicolous fungus *Rosellinula frustulosae* (Vouaux) R. Sant., which is restricted to *L. argopholis* and *L. frustulosa* (Dicks.) Ach. (see HAFELLNER 1986, SANTESSON in ERIKSSON & HAWKSWORTH 1986: 311). Therefore, it seems very likely that the host lichen is *L. argopholis* in all the cases. By the characters mentioned above and its restriction to this host, *T. koliensis* cannot be confused with any other lichenicolous fungus.

1



2

3

Fig. 1: *Tephromela campestricola* growing on *Lecanora pseudistera* (isotype, H-NYL 5887).
Fig. 2: *Tephromela cerasina* growing on *Dirinaria picta* (*G.A. Malme 1284*, UPS).
Fig. 3: *Tephromela koliensis* growing on *Lecanora argopholis* (*S. Ahlner*, UPS).
– Scale: 1 mm.

Further specimens examined:

Finland: Regio kuusamoënsis: Salla k:n Vuorijärvi, Jänisköngäs, på klippa vid vartenfallet, 24 August 1936, *S. Ahlner* (H, UPS). – **Russia**: Karelskaya, Sortavala, [Palosaari], Ruskiiriutta, ad rupem praeruptam, 18 August 1939, *V. Räsänen* (H).

Tephromela colensoica Rambold & Knoph – **sp. nov.**

Type: Brazil: Rio de Janeiro, [Cróte des Orynes], [no date], *A. Glaziou 5119* (PC, hb. Fée! – holotype, containing atranorin and colensoic acid; beside *Buellia* sp., *A. Glaziou 3507*).

Diagnosis: *Tephromelae atrae* similis est, thallo acido colensoico continente, apotheciis immarginatis et discis convexis.

Thallus creamy whitish, areolate. Hypothallus black, at the thallus margin and between the areoles. Apothecia immarginate, shiny black, subconvex, semi-immersed to immersed. Excipulum indistinct. Hypothecium rose-violet to orange, incrusted. Hymenium violet; epihymenium dark violet-brown. Paraphyses c. 5 µm, apically 5-6 µm diam., with lumina of 1.5-2 µm, apically 1.5 µm diam. Asci (scarcely developed), 55-60 × 15 µm. Ascospores (not free) c. 10-11 × 6-7 µm.
Pycnidia not observed.

Chemistry: Containing atranorin, colensoic acid (analyzed by mass spectroscopy).

Distribution: Known only from the type locality in Brazil.

Notes: The type material of this species was cited in FÉE (1873) as "*Lecidea punctata* F. non Eschw." (= *Buellia punctata* (Hoffm.) Massal.) with the collection numbers 3507 and 5119. Material for both numbers is included in one capsule in the hb. Fée in PC. While no. 3507 belongs to *Buellia*, no. 5119 is a species of *Tephromela*, to which the text of FÉE (1873) obviously refers and which is described here as new. Habitually it resembles *Lecidea aterrima* Fée, which has been recognized to belong to the *Tephromela atra* agg. The latter contains atranorin and α-collatolic acid as major substances, and exhibits a violet hymenium and immarginate, adnate to semi-immersed apothecia. Material of *T. atra* agg. with similar appearance also from Brazil, has been distributed in the exsiccata K. Kalb, Lich. Neotropici under the name *Lecidea oreinodes* (Koerb.) Weber & Hertel (no. 233). Specimens of *T. atra* agg. with aspicilioid or lecideoid habitus are also known from the Australasian region, the Subantarctic Islands and from South Africa (HERTEL 1984, RAMBOLD 1989). Recently, two members of the *T. atra* group with α-collatolic acid have been described as new in the rank of species by KALB (1991): *T. nashi* Kalb from Mexico and *T. elixii* Kalb from Venezuela.

Further specimens examined:

Brazil: Prov. Rio de Janeiro, Cróte des Orynes, 8 August 1869, *A. Glaziou "3490"* (M!; 2 specimens: one specimen was found growing beside the isotype material of *Lecidea aterrima* Fée[1]).

I am most grateful to the curators of the herbaria ASU, G, GZU, H, M, PC, U, UPS. I thank J.-G. KNOPH (Berlin) for some chemical analyses, H.T. LUMBSCH (Essen) for the determination of a *Lecanora* species, B.J. COPPINS (Edinburgh) for reviewing the English, B. RAMBOLD (München) for making the habit drawings, H. HERTEL and D. TRIEBEL (both München) for various support. I gratefully acknowledge grant He 953/5 of the Deutsche Forschungsgemeinschaft.

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[1]) *Lecidea aterrima* Fée, Bull. Soc. Bot. France **20**: 317 (1873) ≡ *Aspicilia aterrima* (Fée) Hue, Nouv. Archiv Muséum ser. 5, **2**: 25. 1912 ["1910"] ≡ *Lecanora aterrima* (Fée) Zahlbr., Cat. Lich. Univ. **5**: 363. 1928. Type: Brazil: Rio de Janeiro, Cróte des Orynes, 8 August 1869, *A. Glaziou* 3490 (PC, hb. Fée! – holotype, M! – 2 isotypes, containing atranorin and α-collatolic acid, alectoronic acid. [The isotype material in M is heterogenous: one of the three specimens with no. 3490 is growing beside *Tephromela colensoica*; another contains only *T. colensoica* and therefore is not part of the type collection) ≡ *Lecidea atroflavens* Kremp., Flora **59**: 319. 1876 – (nom. illeg. – ICBN Art. 63.1) ≡ *Lecanora atroflavens* (Kremp.) Vainio, Acta Soc. Fauna Fl. Fennica **7**: 98. 1890.

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Kritische Arten der Gattung Calceolaria aus Chile II.

Eine neue Art aus Mittelchile

von

J. GRAU und Christine EHRHART

Zusammenfassung:
GRAU, J. & Christine EHRHART: Kritische Arten der Gattung Calceolaria aus Chile II. Eine neue Art aus Mittelchile. Sendtnera 1: 289-296. 1993 ISSN 0944 - 0178.

Calceolaria talcana, eine bisher übersehene Art aus dem Gebiet zwischen Talca und Chillán, Mittelchile, wird neu beschrieben. Die halbstrauchige, niedrige, reich verzweigte Art ist charakterisiert durch einen stark behaarten Fruchtknoten, weiche, kurzgestielte Blätter und einen bogigen Wuchs der Äste. Sie ähnelt der weiter verbreiteten *C. integrifolia.*

Resumen

Se describe como nueva *Calceolaria talcana*, una especie hasta ahora no advertida de la región entre Talca y Chillán, Chile central. La especie subarbustiva baja, muy ramificada se caracteriza por un ovario fuertemente pubescente, hojas blandas con pecíolos cortos y un crecemiento arqueado de sus ramas. Se asemeja al *C. integrifolia* de amplia distribución.

Die Gattung *Calceolaria* ist besonders in Mittelchile reich an Arten, die eine bestimmte Wuchsform verkörpern, nämlich den Typ eines Halbstrauchs mit basal verholzten Teilen und einem reichen Austrieb jeweils junger, krautiger Abschnitte. Diese Wuchsform ist augenscheinlich an die mediterranen Klimabedingungen dieses Bereichs besonders angepaßt und ermöglicht auch ein Überdauern während sommerlicher Trockenperioden. Ein gutes Beispiel für diesen Typ stellt *Calceolaria integrifolia* und die ihr manchmal zugeordneten Sippen dar. Die prinzipielle Einheitlichkeit dieser halbstrauchigen Wuchsform führt trotzdem zu habituell unterschiedlichen Arten. Im herbarisierten Zustand verschwinden diese, in Natur und Kultur deutlichen Unterschiede allerdings weitgehend, da die charakteristische Gesamtgestalt der Pflanze bei Teilstücken nicht zum Ausdruck kommt. So kommen häufig Verwechslungen und Fehlinterpretationen vor. Im vorliegenden Fall kann eine Art unterschieden werden, die von Witasek als *C. longepetiolata* Phil. angesprochen wurde. Sie zeigt jedoch einige Eigenschaften, die bei ähnlichen Arten nicht in dieser Weise ausgeprägt sind. Besonders der dicht behaarte Fruchtknoten, die weichen, kurz gestielten Blätter und der reich verzweigte Sproß mit schirmartig ausgebreiteten Infloreszenzen kennzeichnen die neue Art.

Calceolaria talcana Grau & Ehrhart, species nova

Typus: Chile, VII Región del Maule, Prov. de Talca, Abzweigung nach Litú von der Straße San Rafael - Villa Pratt, leg. E. BAYER & J. GRAU - planta culta in "Institut für Systematische Botanik der Universität München" 23.7.92 (Holotypus: M; Isotypi: SGO et CONC).

Untersuchtes Material: Chile, VIII Región, Nuble Quilmo, XII.1901, leg. REICHE (WU) - Chile, VIII Región, Río Chillán, I.1901, leg. REICHE (WU).

Planta suffruticosa, infra ramosissima, ad 35 cm alta, complete et dense hirta et sparse glandulosa. Caules arcuatim flexuosae et umbraculiforme divaricatae. Folia ovata et distincte ad 1,2 cm petiolata, mollia; lamina ad 8 cm longa et 3,5 cm lata, pubescens, marginalis irregulariter dentata, dentibus breviter mucronatis, subtus pallide viridis et nervibus prominentibus ornata, supra obscure viridis. Inflorescentiae pluriflores, ramulis late divaricatis. Flores ad 1,2 cm longae, laete luteae. Sepala ovata, ad 5 mm longa et 2,3 mm lata, dense hirta, patentia vel reflexa. Corolla sparse pilis singulis ornata. Labium corollae superius fornicatum, ad 5 mm longum et 8 mm latum. Labium corollae inferius ad 11 mm longum et 9 mm latum, suborbiculare, orificio parvo, supra in parte centrali distincte alveoliformi impressum et stylum et stamina cingens. Lobulus corollae inflexus, parvus, valde incurvatus et dense glandulis longis ornatus. Gynaeceum densissime hirtum cum stylo ad 7 mm longum. Stamina filamentis ad 5,5 mm longis et antheris ad 1,5 mm longis. Capsula ignota.

Calceolaria talcana ist eine ausdauernde, reich verzweigte, in den älteren Teilen verholzte, bis 35 cm hohe Pflanze mit schirmförmigem Wuchs. Die einzelnen Sprosse verzweigen sich gabelig mit flachem Winkel und orientieren sich bogig bis parallel zum Boden. Die ganze Pflanze ist sehr dicht und kurz weichhaarig, nur vereinzelt treten Drüsenhaare auf. Die Blätter sind eiförmig, bis 7,8 cm lang und 3,2 cm breit und besonders die größeren Blätter sind deutlich bis 1,2 cm lang gestielt. Der Blattrand ist kurz und unregelmäßig gesägt bis gezähnt; die Zähne tragen eine kurze, aufgesetzte Spitze. Die Blätter des Infloreszenzbereiches sind kleiner, sitzend und fast ganzrandig. Die hellgrüne Blattunterseite fällt durch deutlich hervortretende Nerven auf und unterscheidet sich so von der dunkleren Blattoberseite mit eingesenkten Nerven. Die relativ reichblütigen, ± locker hängenden Infloreszenzen entsprechen dem Grundtyp des *Calceolaria*-Blütenstands.

Die Blüten sind bis 1,2 cm lang und leuchtend hellgelb. Die eiförmigen bis 5 mm langen und 2,3 mm breiten, dicht weichhaarigen Kelchblätter stehen ab oder sind zurückgeschlagen. Die Krone ist locker mit Haaren besetzt. Die Oberlippe ist hochaufgewölbt, bis 8 mm breit und 5 mm lang. Die Unterlippe ist ± halbkugelig, bis zu 12 mm lang und 9 mm breit. Das Unterlippendach senkt sich in der Mitte zu einer tiefen Mulde ein, in der die Staubblätter und der Griffel liegen und verschließt den Zugang in den Hohlraum weitgehend. Die Mulde wird durch die Oberlippe nur zu 2/3 überdeckt, Antheren und Narbe bleiben daher sichtbar. Der Drüsenlappen ist stark nach innen eingekrümmt, kaum länger als 1,5 mm und dicht mit langen Drüsenhaaren besetzt. Die Filamente sind 5,5 mm, die gleichgebauten Antheren 1,5 mm lang. Der Fruchtknoten ist sehr dicht und relativ lang behaart, während der Griffel kahl ist. Da die selbststerile Pflanze keine Früchte ansetzt, bleibt die Kapsel bisher unbekannt.

Calceolaria talcana besiedelt offene, trockene Wegränder und sommertrockene Hänge Mittelchiles zwischen Talca und Chillán.

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Abb. 1: Calceolaria talcana: Habitus.

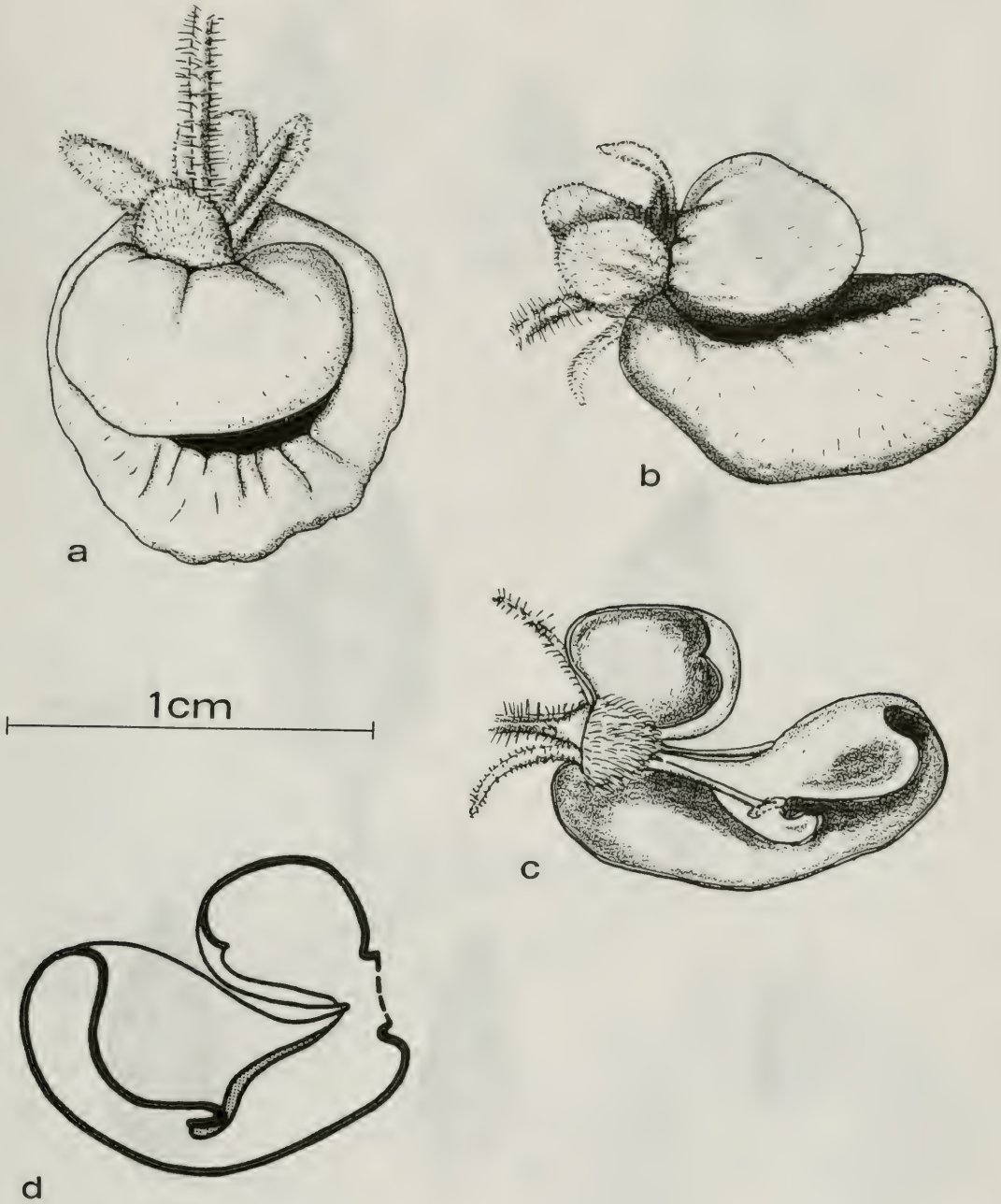


Abb. 2: Blüte: a: von oben
b: von der Seite
c: im Längsschnitt
d: Längsschnitt, schematisch

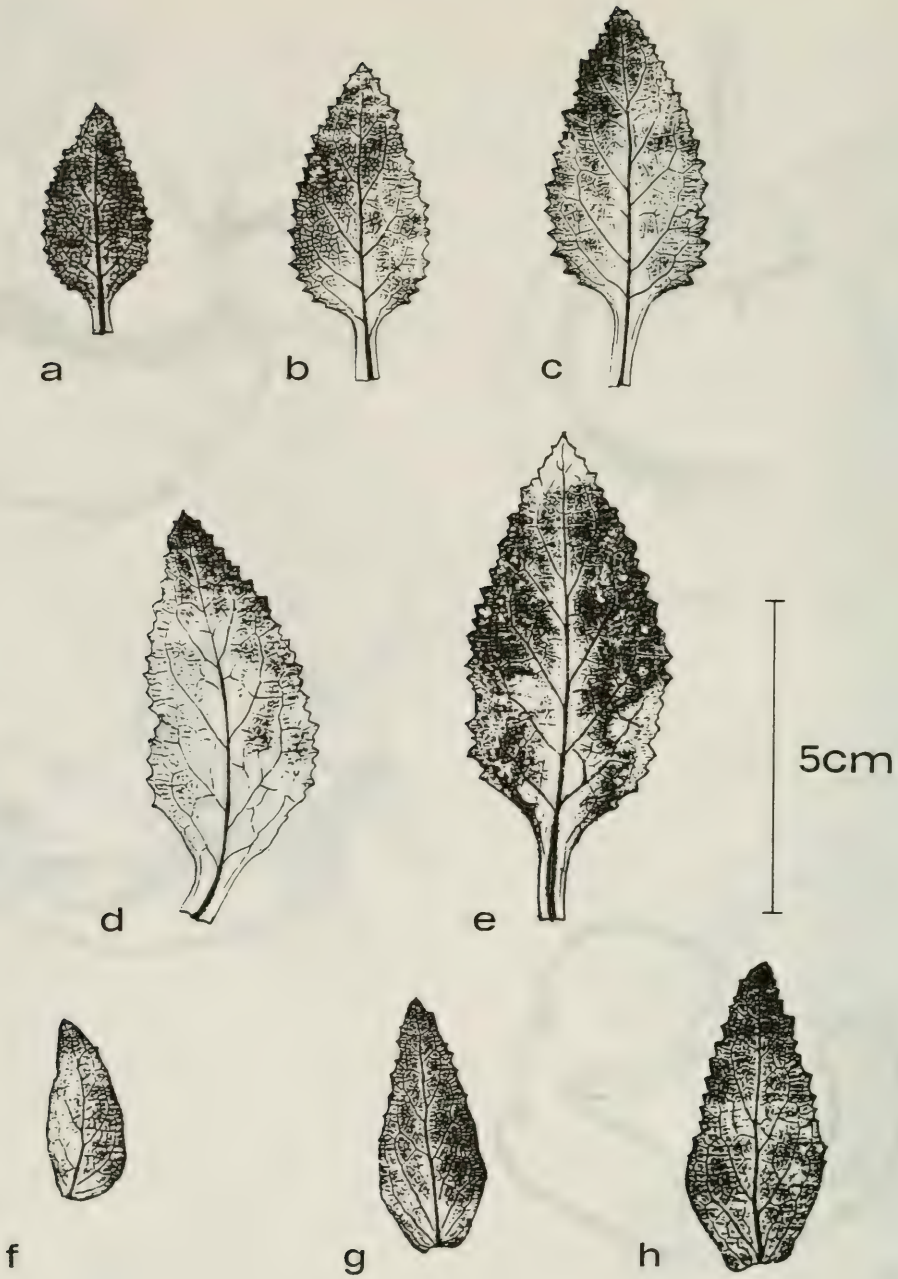
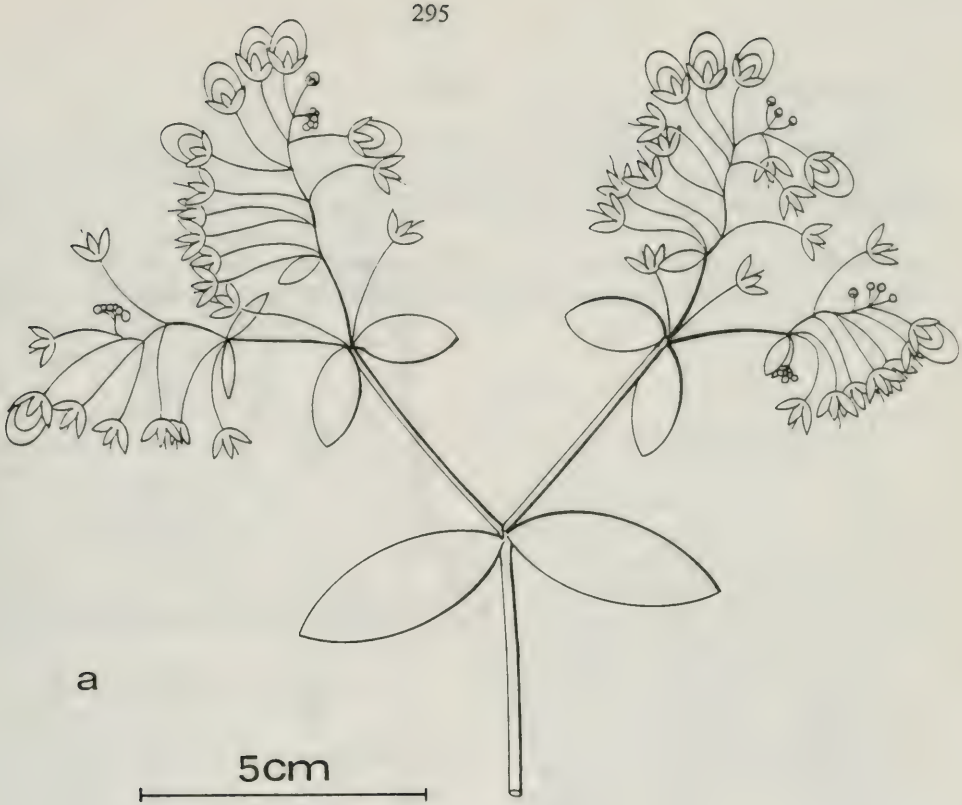
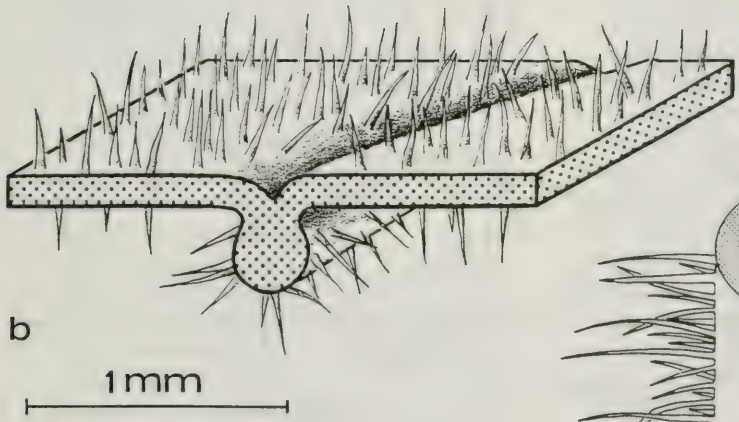


Abb. 3: Blätter: a-e: im vegetativen Bereich
f-h: im Infloreszenzbereich
von links nach rechts jeweils absteigend





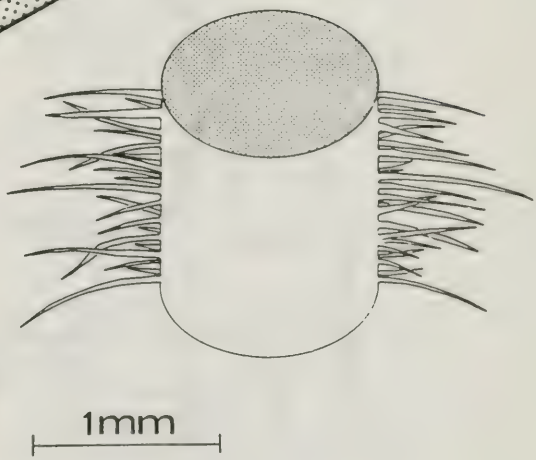
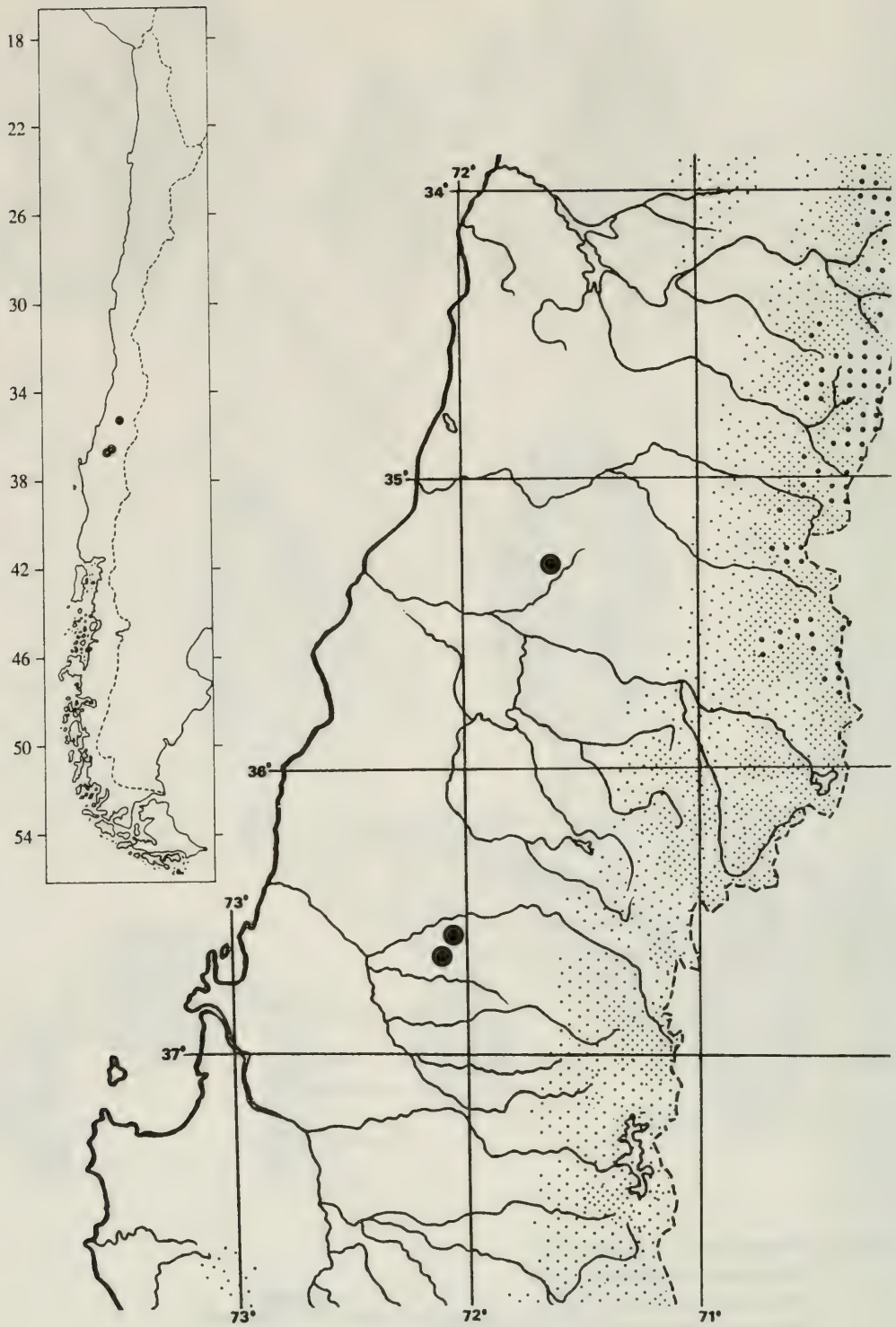


Abb. 4 a: Infloreszenz halbschematisch
b: Behaarung der Blattoberseite
c: Behaarung des Sprosses im Infloreszenzbereich - nur die im Profil sichtbaren Haare sind gezeichnet



Die Verbreitung von Calceolaria talcana in Chile

Index

Anmerkung: Der Index zu GAZER, M.: Revision of Astragalus L. sect. Sesamei DC. (Leguminosae) befindet sich auf S. 154, derjenige zu MAASSOUMI, A.A.: Revision of Astragalus L. sect. Malacothrix Bunge (Leguminosae) in Iran auf S. 239. Die darin genannten Taxa werden hier nicht nochmals aufgeführt.
Neue Taxa und Neukombinationen sind mit einem * vor dem Namen gekennzeichnet. Der Haupteintrag ist unterstrichen, Hinweise auf Abbildungen sind durch ein * nach der Seitenzahl markiert.

Acarospora glaucocarpa (Ach.)Koerb. 278
- macrospora (Hepp)Bagl. 278
*Adelococcaceae Triebel 278
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- interlatens (Arnold)Matzer & Hafellner 278
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- myrinii (Fr.)B.Stein 275
*Astracantha breviflora (DC.)Podlech 269
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